Prospective observational study to find correlation between non-invasive ultrasound based shear wave velocity by acoustic radiation force impulse ARFI and semi-quantitative histopathological renal fibrosis scoring among patients undergoing diagnostic renal biopsy in native kidneys

A dissertation submitted to the Tamilnadu

Dr. M.G.R. Medical University in partial fulfillment of the University regulations for the award of D.M. (Branch – III) (Nephrology).

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BONAFIDE CERTIFICATE

This is to certify that the work presented in this dissertation titled **"Prospective observational study to find correlation between non-invasive ultrasound based shear wave velocity by acoustic radiation force impulse ARFI and semi-quantitative histopathological renal fibrosis scoring among patients undergoing diagnostic renal biopsy in native kidneys**" done towards fulfillment of the requirements of the Tamilnadu Dr. M.G.R. Medical University, Chennai for the D.M. (Branch–III) (Nephrology) exams to be conducted in August 2014, is a bonafide work of the candidate Dr. Sudhakar G, Senior Post-graduate student in the Department of Nephrology, Christian Medical College, Vellore under my guidance and supervision. This dissertation has not been submitted, fully or in part to any other board or University.

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CONTENTS

ABBREVIATIONS

CKD-chronic kidney disease

NKF –K/DOQI- National Kidney Foundation-kidney Disease Outcome Quality Initiative

GFR-Glomerular filtration rate

eGFR- estimated Glomerular filtration rate

KDIGO Kidney Diseases: Improving Global Outcomes

CGA-cause, GFR albuminuria

AER- Albumin excretion rate

ARFI- Acoustic radiation force impulse

ECM- Extra Cellular Matrix

EMT- Epithelial mesenchymal Transition

α-SMA- Smooth Muscle Acting

MCP- Membrane Cofactor Protein

RANTES- Regulated on Activation, Normal T cell Expressed and Secreted

PDGF-Platelet Derived growth factor

EGF-Epithelial Growth Factor

TGF-β-Tissue Growth Factor- β

MMP-Matrix metalloproteinase

tPA- Tissue plasminogen activator

AngII- Angiotensinogen II

CNI- Calcineurin inhibitors

TA -Tubular Atrophy

IF- Interstitial Fibrosis

US – Ultrasound

B- Brightness Mode

PRF- Pulse repetition frequency

CT- Computer Tomography

MRI – Magnetic Resonance Imaging

RF-Radiofrequency

EI-Ealastography

SWEI-Shear Wave Elasticity Imaging

SSI-Supersonic shear imaging

VA-Vibro acoustography

SDUV-Shear wave Dispersionultrasound vibrometry

MRE-Magnetic resonance Imaging

MI-Mechanical Imaging

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Abstract

TITLE OF THE STUDY : **Prospective observational study to find correlation between non-invasive ultrasound based shear wave velocity by acoustic radiation force impulse ARFI and semi-quantitative histopathological renal fibrosis scoring among patients undergoing diagnostic renal biopsy in native kidneys**

DEPARTMENT : Nephrology

NAME OF THE CANDIDATE : Dr. Sudhakar G

DEGREE AND SUBJECT : D.M., Nephrology

NAME OF THE GUIDE : Prof. Dr. V. Tamilarasi

OBJECTIVE

To study the correlation between non-invasive ultrasound based shear wave velocity (SWV) by acoustic radiation force impulse ARFI and semi-quantitative histopathological renal interstitial fibrosis (IF) scoring among patients undergoing diagnostic renal biopsy.

MATERIALS AND METHODS

110 patients with renal disease advised for renal biopsy as part of the management by the treating nephrologist were enrolled in the study. Correlations between Shear Wave Velocity in the lower pole of the native kidneys measured by a pre biopsy ARFI and laboratory tests were analyzed in study population. Standard statistical analysis was used with SPSS 11.

RESULTS

The study population (n=104) included 73.08% males with a male to female ratio of 2.7:1 with mean age for males and female participant being 41.41±13.8 and 32.07±13.59 respectively.The mean height and weight of the study population was 162.14±7.94 cm and

62.70±12.76 with a mean BMI of 23.83±4.3. The mean haemoglobin was 11.43±2.1, with a mean serum albumin level of 3.34±1.03. Nephritic syndrome (46.2%) was the most common presentation followed by nephrotic syndrome (33%) and chronic interstitial nephritis (17%). The most common diagnosis was the primary glomerulonephritis (75%) with IgA and proliferative GN being major contributors.The clinical and radiological characteristics were evaluated for the assessment of the prediction of the interstitial fibrosis. The mean e GFR (ml/min/1.73 m^2) in the study population as a function of the CKD staging was 117.49±26.37 in stage 1, 75.68±8.69 in stage 2, 42.94±8.53 in stage 3, 23.21±4.71 in stage 4 and 6.96±2.57 in stage 5.The mean SWV velocity in the different CKD stages were 1.73±0.59, 1.78±0.34, 1.82±0.51, 1.94±0.86, 1.80±0.53 in stage 1,2,3,4 and 5 respectively. There was no correlation between the Shear wave velocity (SWV) measured and the extent of IF and SWV was not helpful in prediction of the extent of fibrosis and there was good negative correlation between eGFR and the interstitial fibrosis. Smoking and hemoglobin were significant predictors of severe IF. The mean ARFI measured SWV in the realigned interstitial groups were 1.69±0.68 and 1.80±0.53 but these were not statistically significant between the early fibrosis and late fibrosis.

CONCLUSION

There was no correlation in the non invasive ARFI measured mean as well as median SWV in the lower pole and the interstitial fibrosis in renal biopsy. The clinical predictors like eGFR, Systolic blood pressure, smoking, hemoglobin at presentation and echogenicity in kidneys were significant. The histological markers of tubular atrophy and the glomerulosclerosis had a good correlation with IF. The renal biopsy remains the gold standard for assessment of IF until further sensitive and valid methods are available.

Keywords: ARFI, SWV, Interstitial fibrosis, biopsy, clinical predictors, grades of Interstitial fibrosis, eGFR.

Introduction

Renal Interstitial Fibrosis, a non-specific manifestation of several renal diseases (especially glomerular diseases), that portends poor long term prognosis in terms of renal survival and reaching end stage renal disease. It forms an essential part of the final common pathway of progressive renal damage. In various diseases the degree of interstitial fibrosis has been correlated with poor long term outcomes of kidney disease. Currently assessment of renal interstitial fibrosis could be done reliably only by histological scoring in the renal biopsy. Ultrasound based ARFI shear wave velocity assessment has been shown to be of use in assessment of hepatic fibrosis. The current study is undertaken to evaluate if the ARFI assessment correlates well with renal interstitial fibrosis as assessed by histological scoring, thereby to ascertain its utility as a non-invasive surrogate of renal interstitial fibrosis.

At Department of Nephrology, CMC Vellore, approximately 15-25 patients undergo diagnostic renal biopsy every week, for various clinical indications. The purpose of this study is to evaluate correlation of Acoustic Radiation Force Impulse (ARFI) shear wave velocity with fibrosis measured in patients undergoing diagnostic renal biopsy and hence to look for the utility of this method of imaging for screening in patients with advance CKD and preclude a renal biopsy which is an invasive procedure associated with complications like bleeding and other associated complications.

Review of Literature

Chronic Kidney Disease (CKD) as per the Kidney Diseases: Improving Global Outcomes (KDIGO) 2012 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease (KDIGO) guidelines 2012 is defined as "abnormalities of kidney structure or function, present for more than 3 months, with implications for health and CKD is classified based on cause, Glomerular Filtration Rate (GFR) category, and albuminuria category (cause, GFR albuminuria CGA)" [1].

A lot of published data indicated the adverse consequences and outcomes in individuals with an albumin excretion rate (AER) >30 mg/24 hours and/or glomerular filtration rate (GFR) < 60 ml/min/1.73 m^2 (GFR categories G3a-G5), inconsequential of either aetiology or duration of reduced kidney function. This of the correlation between GFR, rate of albumin excretion and prognosis has appreciably enhanced the understanding of CKD in different populations. [2,3,4,5]

Table 1.Definition of Chronic Kidney disease

Criteria for chronic kidney Disease (Either of the following present for >3 months)[1]	
Markers of kidney damage (One or More)	Albuminuria(AER≥ 30mg/24 hr;ACR≥30 mg/g (≥3 gm/mmol)
	Urine sediment abnormalities
	Electrolyte and other abnormalities due to tubular disorders
	Abnormalities detected by histology
	Structure abnormalities detected by imaging
	History of Kidney transplantation
Decrease GFR	GFR< 60 ml/min/1.73 m^2(GFR categories G3a-G5

Epidemiology of chronic kidney disease

Ranked as 18th with an annual death rate 16·3 per 100,000 by Global Burden of Disease study 2010, chronic kidney disease was only second to that for HIV and AIDS in terms of the rate of increase in deaths over the past two decades. In the order of leading causes for overall increase in years of life lost due to premature mortality chronic kidney disease was only behind HIV and AIDS (396%) and diabetes mellitus (93%) with 82 % premature mortality. [6]

With respect to the developing world, the south Asia and Latin America in the globalisation has led to an emerging spectra of continued high prevalence of infectious diseases with rising prevalence and severity of lifestyle related disorders, such as diabetes and hypertension which has lead to an increase in the incidence and prevalence of the chronic kidney disease [7,8,9]

Although the need for treatment of chronic kidney failure with dialysis and/or kidney transplantation arises in only1% of people with CKD, it remains the most expensive of chronic diseases and reduces lifespan significantly. The costs of dialysis and transplantation consume disproportionate amounts within the health-care budgets in all jurisdictions (5% of annual budgets consumed by less than 1% of the population). Consequently, CKD has become an important public health problem in the global scenario, imposing an enormous socioeconomic burden on the affected communities at an individual level and on the society as well. As number of patients with diabetes mellitus and obesity continues to increase proportionally, the trend of increasing prevalence of CKD will not halt in the upcoming decades.

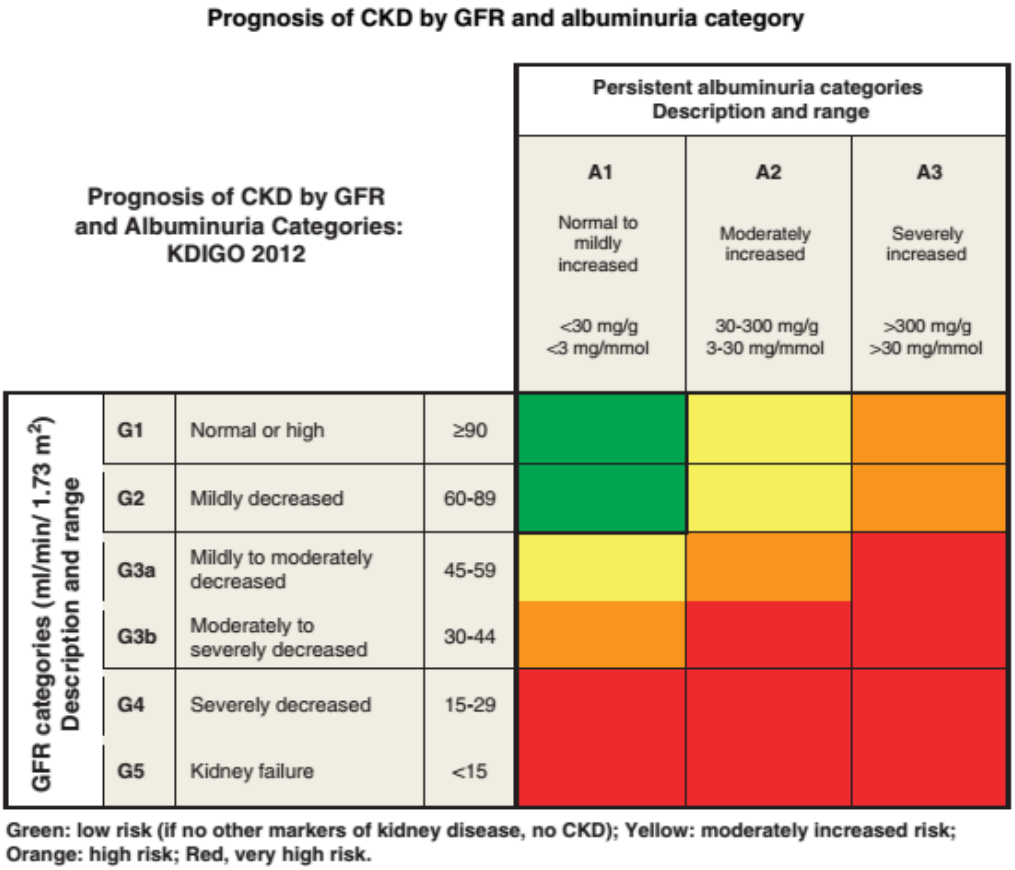

Figure 1. Classification of CKD and the prognosis by GFR and Albuminuria[1]

Identification of people at earlier time points in the progression of CKD and with appropriate early management and referral of those who would benefit from nephrology services, should lead to more apt utilization of the limited medical and speciality services in the developing countries like India.

The major limitation in the early identification and treatment of the chronic kidney disease irrespective of the aetiology is the inability of the current methods of diagnosis in accurately staging the extent of the chronic kidney disease in view of the inherent source of error in estimating the glomerular filtration rate which have been elucidated in the table 2.This emphasises that we understand the basic mechanism of progression of chronic kidney disease

and find out ways to estimated this rate of progression and time points where it may be fruitful to intervene to arrest this down slide of renal function.

Table 2 Source of error in GFR estimating using creatinine[1]

Source of error	Example
Non-steady state	Acute Kidney Injury (AKI)

Non- GFR determinants of Scr that differ from study populations in which equations were developed
 	
Factors affecting creatinine generation
	• Race /ethnicity other than US and European black and white
	• Extremes of muscle mass
	• Extremes of body size
	• Diet and nutritional status
	  ○ High protein diet
	  ○ Creatine supplementation
	▪ Muscle wasting disease
	▪ Ingestion of cooked meat
	▪ Decrease by drug induced inhibition
	  ○ Trimethoprim
	  ○ Cimitidine
	  ○ Fenofibrate
	▪ Dialysis
	▪ Decrease by inhibition of gut creatinase by antibiotics
	▪ Increased by large volume losses extracellular fluid

Higher GFR	Higher biological variability in non-GFR determinants relative to GFR • Higher measurement error in Scr and GFR
Interference with creatinine assay	• Spectral interferences (e.g., bilirubin, some drugs) • Chemical interferences (e.g., glucose, ketones, bilirubin, some drugs)

Abbreviations AKI, Acute kidney injury, GFR, glomerular filtration rate Scr serum creatinine

MECHANISM OF PROGRESSION OF CHRONIC KIDNEY DISESAE

A varied spectra of insults which can be immunological, mechanical, metabolic and toxic insults can result in kidney disease. These predominantly affect the three disitictive and functional compartments of the kidney; the glomerulus ,vasculature, and tubulointerstitium.

Irrespective of cause,there will be a decline in renal function with time in all patients with chronic kidney disease[10]. This irrevocable progression leading to stage 5 CKD, a condition that is unless supported by one of the modality of currently available renal replacement therapies i.e hemodialysis, periotneal dialysis or renal transplantation will invaraiablly progress to increased morbidity and inevitable mortality. Histologically endstage kidney disease manifests itself as fibrotic lesions affecting each compartment; glomerulosclerosis, vascularsclerosis and tubulointerstitial fibrosis.

Of the three compartments the best correlate of the inexorable progreesion with declining renal function is with the tubulointerstitial fibrosis.This has been fluently shown more than half a centuary ago by Risdon [11] in patients with persistent glomerulonephritis and subsequently by several studies in chronic kidney disease with varied etiologies[12,13,14]. In diabetes, there is a direct and inverse correlation betwen increase in interstitial fibrosis with the decrease in creatinine clearance [15]. On the contrary, the extent of glomerular inflammation or sclerosis does not show a relationship with outcomes of kidney diseases[11-15]. The explaination for this could be that periglomerular fibrosis results in peritubular scarring with impairment of flow into the proximal segment of the nephron.In this scenario the glomerulus may appear structurally normal but,functionally, is "atubular." It was well demonstration that the number of atubular glomeruli out number glomeruli with global sclerosis in the renal ablation model[16]. The above evidence provides a description for the credibility of utilising the tubulointerstitial scores over glomerular scores for predicting renal outcomes. Tubulointerstitial damage and reduction in glomerular filtration rate (GFR) are closely interlinked as the tubuloglomerular feedback would reduce GFR, if increased distal sodium delivery resulting from the defective proximal sodium reabsorption in the injured proximal tubule. The postglomerular ischemia which is a consequence of glomerular injury results in tubulo interstitial hypoxia with reduced blood flow in the pritubular capillaries and

unrestrained oxidative stress, resulting in tubular injury,concluding in loss of that nephron.This loss of individual nephrons would put an undue hemodynamic stress over the remaining nephron units with increased nephron loss which initiates a vicious cycle of nephron loss and cumulative hemodynamic stress.

Kriz et al [17,18] proposed and demonstrated other mechanisms of tubulointerstitial damage induced by glomerular injury. These are histologically represented by the degenerative and inflammatory lesions like capsular synechia, resulting in misdirection of the glomerular filtrate in to periglomerular region. This wrongly directed glomerular filtrate with all its proteins and cytokines, and the increase in tubular protein content will result in various inflammatory pathways in the tubules and interstitium, resulting interstitial inflammation and infiltration with infringement of the tubular architecture, resulting in the functional nephron loss secondary to the glomerular dysfunction and scarring.

TUBULOINTERSTITIAL INJURY AND ITS PROGRESSION

A number of factors play a major role in the progression of renal injury. Proteinuria may be a both a risk factor and a pointer of disease severity, but is a helpful therapeutic predictor in the enduring management of chronic kidney disease [19]. An out of place activation of the alternative pathway of complement on the surface of tubular cells may also play a role, through the terminal C5b-9 membrane attack complex [20,21]. This activation of complement might be secondary to the cytokine stimulation as a result of the Proteinuria and the ammonia as result of its excessive production as a compensatory mechanism for the metabolic acidosis in the more advance stages of the chronic kidney disease .The inappropriate complement stimulation will result in oxidative stress which is both a cause and consequence of interstitial inflammation precipitating a vicious cycle. The structural changes will lead to tissue hypoxia at the microcirculation resulting from structural disruption of peritubular capillaries and or

angiotensin-induced vasoconstriction is a final common pathway in the development of tubulointerstitial fibrosis. Hypoxia results in activation of the fibroblasts, [22] stimulate the epithelial mesenchymal trans-differentiation (EMT) [23] and activate apoptotic pathways in tubular cell [24].

The cellular basis of fibrosis in all three anatomical compartments is associated with the mesenchyme derived cellular activity. The activated interstitial fibroblast and glomerular mesangial cell fibroblast cell on activation with by the inflammatory cytokines will acquire phenotypic features of smooth muscle [25,26,27]. In addition to being the principal cell in each compartment producing extracellular matrix, the resident mesenchymal cell is the force for contraction and reorganisation of extracellular matrix, thus aggravating the density of the scar tissue [25]. The renal interstitial fibroblast is typical of all three scenarios of tubulointerstitial fibrosis, glomerulosclerosis and vascular nephrosclerosis and has been the focus of our research in progressive tubulointerstitial fibrosis. De novo synthesis of a smooth muscle actin (α SMA), is a signature of the activated fibroblasts, so called myofibroblasts, which accumulate and are characteristic feature of all forms chronic and progressive renal disease [25,27]. These signature cells probably have origin from different sources, including resident fibroblasts, also pericytes, hematopoietic precursors and transition of adjacent epithelial cells and endothelial cells, the relative importance of each being the subject of much debate in view of incomplete evidence [28].

The unique architectural and evolutionary complexity of the kidney with twenty different type of cells in its architecture and terminal differentiated cell lines with poor ability of regeneration which under stress of the uremic milieu and the cytokine barrage as a

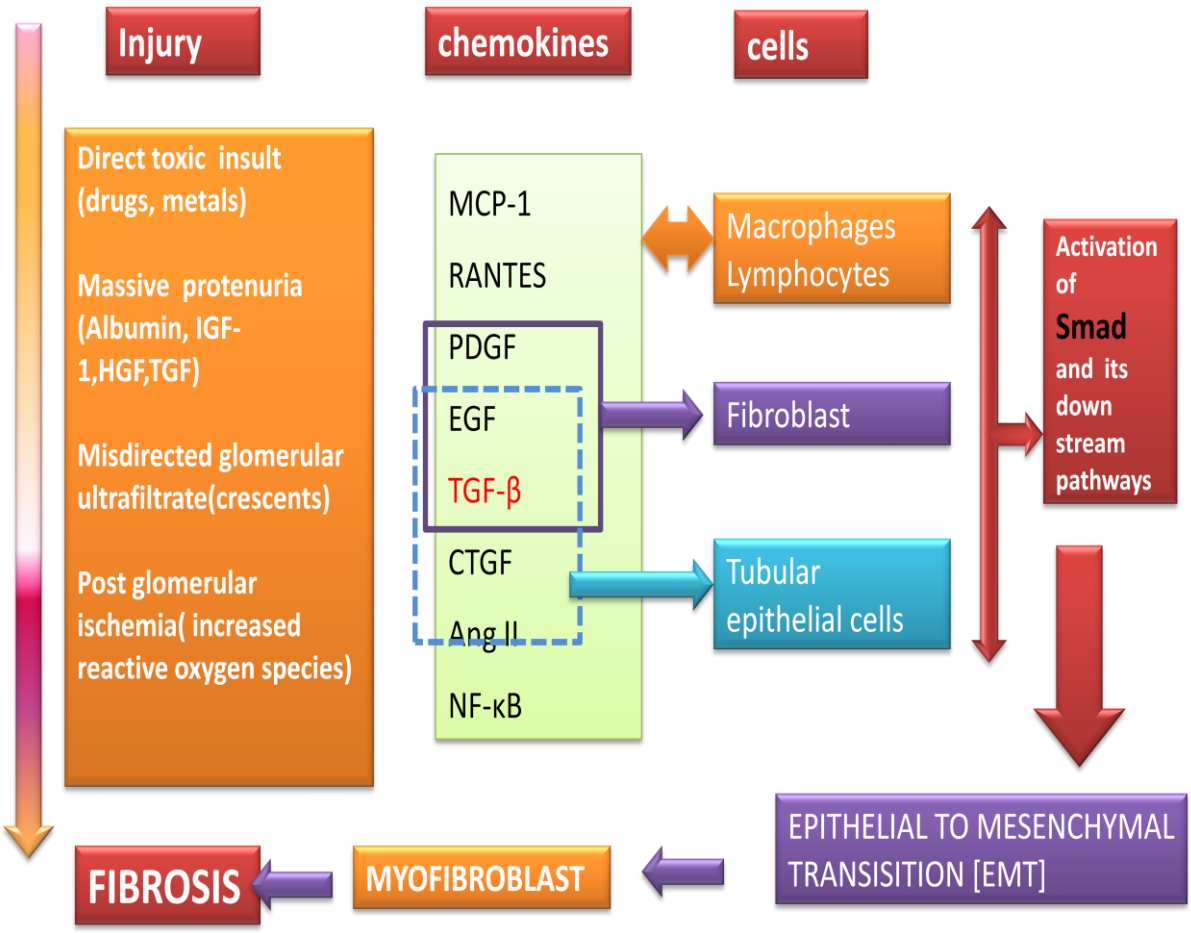

Figure 2 Molecular mechanisms and key cytokines in the interstitial fibrosis

consequence of the Proteinuria and the increased susceptibility of the tissues to hypoxia in view of a high oxygen demand and the increased role of the rennin angiotensin aldosterone system in the day to day regulation of glomerular hemodynamics and ability to promote fibrosis with the up regulation of the TGF-β and subsequent downstream pathways, makes for a perfect recipe for the uninhibited progression of the inflammation to the fibrosis and scarring manifesting as contracted kidney a hall mark of the end stage kidney disease in many situations [29].

MOLECULAR PATHWAY IN RENAL FIBROGENESIS: [Fig2]

Although many factors have been documented to have a role in fibrogensis, including cytokines and hormonal, metabolic, and hemodynamic factors, the key fibrogenic factor is transforming growth factor-β (TGF-β) and its effectors, Smad signalling pathway play an essential role[30,31].

Increased expression of TGF-β is a widespread in almost every CKD, both in animal models and in humans. Experimental studies in animals have shown that, TGF- β as a sole factor can stimulate mesenchyme derived cells and tubular epithelial cells to undergo myofibroblastic activation or transition. An induced expression of TGF-β, via gene delivery in vivo or in transgenic mice, causes renal fibrosis. Conversely, neutralising TGF- β by multiple strategies will help prevent the renal fibrosis and thus progressive loss of kidney function [32].

THE MOLECULAR MECHANISMS IN FIBROSIS

The expression and synthesis of Extra Cellular Matrix (ECM) proteins by the interstitial fibroblast is regulated at the level of gene transcription secondary to various extracellular fibrogenic signals. The essential fibrogenic factors include Tissue growth factor(TGF-β1), platelet derived growth factor (PDGF), Fibroblast growth factor 2(FGF2), Connective Tissue Growth Factor(CTGF) and angiotensin II (AngII), whereas hepatocyte growth factor and bone morphogenetic protein 7 (BMP7) oppose the production of matrix components by opposing TGF-β1 action[33,34,35,36,37,38].Through their corresponding sensors and precise downstream intracellular signal cascades, the fibrogenic cytokines initiate a multitude of regulators that influence specific elements in the promoter regions of the collagen and fibronectin genes to promote their transcription which is in turn regulated by an array of microRNAs[34-37]. Many studies have provided significant insights into explaining regulation of matrix genes at the molecular level. But it still remains to be elucidated if these in vitro

studies reflect in vivo regulation of the fibrogenesis and how these fibroblasts in the pro fibrotic milieu with spectrum of cytokines which can promote and or oppose the fibrosis, react to these cytokines in a synchronized fashion. TGF-β induction also appears to be a point of convergence in the pathways that integrates either on its own or indirectly, through the upstream activation of TGF β inducers by factors such as angiotensin II and high glucose, or downstream effectors like the connective tissue growth factors.

The TGF-β through transmembrane receptors type I and type II serine/threonine kinase receptor [33] activation unleashes the phosphorylation and stimulation of its downstream signalling messengers, Smad2 and Smad3. These downstream phosphorylated Smad2/3 bind to common partner Smad4, together are translocated into the nuclei, where they regulate TGF-β responsive gene transcription. The TGF-b/Smad signalling pathway is controlled at both pre receptor and post receptor level through several levels of regulation, which include the TGF-β gene expression, latent TGF-β activation, expression of its receptor and post receptor Smad signalling.

In chronic inflamed renal tissue, there is a hyperactive TGF-β/Smad signalling with increased induction of TGF-expression. In addition to this there is an augmented post-translational activation of TGF-β protein and release from latent complexes. There is also an over expression of the TGF-β receptors in an inflamed kidney. The Smad signalling in kidney is strictly regulated by a family of repressors proteins known as Smad transcriptional co repressors, which include SnoN, Ski, and TGIF [32]. Through multitude of mechanisms, these molecules antagonize the Smad-mediated gene transcription, thereby protecting the tissue from the uninhibited TGF-β response. These co-repressors expression is progressively decreased in the fibrotic kidney which results intensification of TGF-β signal [38].

It is obvious that the TGF-β/Smad signalling in renal fibrosis is stimulated in such a way that is unrestrained, a scenario akin to tumour genesis. Remarkable efforts at inhibiting TGF-β action in an attempt to hinder the relentless progression of renal fibrosis have been attempted [32]. Of late, many therapeutic interventions were tried, like antisense inhibition of TGF-β expression, antibody antagonizing of the TGF-β, soluble TGF-β receptor, or blockade of TGF- β activation by decorin [33,39,40] and receptor inhibitors, which resulted in a variable range of improvement of kidney structure and function in animal models. But these were not translated in to human studies as achieving a successful antisense inhibition of TGF-β expression in the human kidney using present techniques remains elusive. But more significantly, we unaware of the impact of prolonged inhibition of TGF-β as a therapeutic approach to renal fibrosis, particularly in relation to its established anti-inflammatory cytokine properties. As has been eluded earlier the inflammation presumably precedes the onset and progression of chronic kidney disease, we should be cautious, that prolonged inhibition of TGF-β in humans may enhance inflammation, implying unfavourable outcomes and a therapeutic dilemma. Over expression of TGF-β1 in transgenic mice is protective against renal fibrosis, principally through anti-inflammation activity [41] and mice with TGF-β1 deficiency succumb to unregulated and excessive inflammation [32]. To circumvent this problem, several strategies at TGF-β downstream signalling pathways mediating fibro genesis were targeted which include the decreasing of connective tissue growth factor expression or activity or inhibition of Smad signalling through the delivery of inhibitory Smad7[42]

MATRIX METALLOPROTEINASE (MMP) IN TISSUE REMODELLING IN RENAL FIBROSIS

Matrix production and its degradation are a continuous process and the excessive matrix accumulation seen in fibrotic kidney results from both uninhibited production of matrix

components and ineffective destruction as a part of tissue remodelling. The plasminogen activator inhibitor-1 and tissue inhibitor of matrix metalloproteinase-1 are often up regulated in a diseased kidney.

MMP historically are considered to reduce matrix accumulation and hence are assumed to reduce the renal fibrosis after injury. A contradictory picture has been proposed in recent literature regarding function of these proteins in relation to fibrotic lesions in vivo. Tissue plasminogen activator (tPA) though proteolytic can promote interstitial fibrosis through induction of MMP-9 gene expression, enhancing the tubular basement disruption and epithelial mesenchymal transition.

ROLE OF TUBULAR ATROPHY IN INTERSTITIAL FIBROSIS

Tubular atrophy and dilation were considered together with interstitial fibrosis en bloc as evidence of progression to end stage kidney disease [43,44]. Nonetheless, which of these changes in these compartments are responsible for the progression and which specific changes interrelate causally is not well established. El Nahas has proposed that tubular atrophy is a manifestation of functional overload or a higher rate of metabolism in hypertrophic (dilated) tubules, thought conclusive evidence is lacking in favour of the above hypothesis[44].

Several previous studies have emphasised on the significance of injured tubules in initiation and augmentation of tubulointerstitial injury by increased expression of various cytokines including growth factors[45,46] and matrix proteins[47,48]. The trans-differentiation of tubular epithelial cells into phenotype myofibroblasts [49] and an increased index of proliferation among degenerating tubular cells have been documented in fibrotic kidneys [50].

The simultaneous origin of the pathological changes in tubules and interstitial fibrosis in most experimental models of renal disease makes it difficult to establish a causal relationship between these changes and to delineate the interacting mechanism.Tubular atrophy precedes glomerular alterations like hyalinosis and capsular synechia, which are thought to be induced by hyperfiltration, onset of severe proteinuria, hypertension, or hypercholesterolemia and are like to predate the development of the interstitial fibrosis. And the predominant insult in the origin of the tubular atrophy and probable subsequent interstitial fibrosis appears to be hypoxia [51].

RENAL FIBROSIS: ROLE OF HYPOXIA AND MICROCIRCULATION

Glomerular endothelial cells form the first line in the glomerular filtration barrier and any injury to endothelium will therefore result in the worsening of the renal function. The renal fibrosis which includes the interstitial fibrosis and tubular atrophy correlated more with the decline in the renal function than the glomerular sclerosis. The renal fibrosis has been postulated to have to originated out of several mechanism among which the most important paradigms has been the hemodynamic alterations and consequent increase of the intra-glomerular pressure, nephrotoxic effects of the Proteinuria on the renal histological spectrum [52].The lineage tracing studies concluded pericytes as the major source of interstitial myofibroblasts in the renal fibrosis in a rodent model, throwing light at refocusing research on renal on vascular injury as one of the primary mechanism as an initiating factor for renal fibrosis[53].

The loss of renal microvasculature is a result of lack of the angiogenic responses resulting from either inadequate endothelial proliferation or from imbalance in the local milieu with respect to the angiogenesis promoting and inhibiting factors [54]. Several animal studies showed that the decreased density of the peritubular capillaries correlates with interstitial

fibrosis but none of these studies demonstrated that it precedes the later. Current evidence in animal studies points to tubular hypoxia preceding the tubulointerstitial fibrosis [55,56].

Steegh et al. showed that reduced peritubular capillaries (PTC) in protocol biopsies after kidney transplantation done at an interval of 3 months, correlated inversely with inflammation and predicted increased fibrosis/atrophy and decrease in e GFR at 12 month [57]. In a similar study which looked at the angiogenesis in allograft recipient with acute rejection revealed an increase in the angiogenesis and increased PTC density and this angiogenic response correlated with more fibrosis in follow up biopsies[58] which leads us to the query as to which is first the fibrosis or the decrease in the PTC density.

IMPACT OF INFLAMMATION AND FIBROSIS ON THE KIDNEY

It is an established fact that CKD progression is proportional to increasing tubulointerstitial fibrosis, tubular atrophy and glomerulosclerosis with a complex interaction between several pathways that mediate transformation of persistent inflammation to fibrosis with increase in the synthesis of the collagen and decrease in its break down by the matrix metalloproteinases. The typical phenotype of renal fibrosis is the myofibroblast and in concurrence with other inflammatory cells results in the intricate network of events leading to impact on the renal parenchyma which are complex and specific for each stage of the CKD.

DIAGNOSTIC AND QUANTITATIVE EVALUATION OF THE INTERSTITIAL FIBROSIS AND ITS CLINICAL SIGNIFICANCE:

Evaluation of interstitial fibrosis conventionally has been done on the renal biopsy specimens in both the native kidneys and the allograft and it has been the gold standard for this evaluation. The qualitative patterns of interstitial fibrosis like the striped pattern in the Calcineurin (CNI) toxicity are not specific and may also been seen in the hypertensive

kidneys and hence are these may not have a single cause or consequence and are not very useful in the assessment of the fibrosis as a predictor of aetiology or prognostication of rate of decline of renal function. In addition these pattern are less common than the diffuse or the patchy interstitial fibrosis pattern as the aetiology associated with a specific patterns are usually present in combination with other factors which are either causal or associated with the renal disease. There are several studies which have demonstrated a positive correlation between the kidney function and the extent of the fibrosis [59].

Tubular atrophy (TA) is described in renal tissues which show dilated tubules with thin or sparse lining epithelial cells with pale cytoplasm and functionally this is associated with loss of the tubular re-absorption and secretory function. The tubular atrophy is typically associated with interstitial fibrosis (IF) and are commonly described in combination as tubulointerstitial fibrosis or IFTA. The quantitative assessment of IF is useful in the prediction of the renal function both in the native kidneys as well as renal allograft [60,61,62,63,64].

An objective and a quantitative assessment of IF measurement has application in a variety of areas like, research focused on therapeutic inhibition of IF, comparison of protocol biopsies in study of renal allografts, therapeutic [65,66,67,68] decisions regarding immunosuppression in primary glomerulonephritis and in avoiding subsequent biopsies in individuals with advance fibrosis in prior biopsy when they present with worsening of renal function. The last area is of particular interest because these are cases which have higher risk of complications associated with the renal biopsies. Fibrosis predisposes these kidneys for bleeds in view of abnormal vascular architecture and significant hypertension and a uremic environment which causes uremic platelet dysfunction further increasing the risk of a bleed. The visual assessment of fibrosis on a Masson's trichrome-stained slide in renal biopsy specimen is often conventional practice in most institutions [69]. However this practice had been shown to

have poor reproducibility [70,71]. According to Banff criteria[72] trichrome is typically used since the recommendation for slide preparation is seven slides containing multiple sequential sections, 3 with Haematoxylin and Eosin, 3 with Periodic Acid Schiff or silver stains, and 1 with a trichrome stain. Under Banff working classification of renal allograft pathology, fibrosis is scored as follows:

Table 3 Banff Criteria for Interstitial Fibrosis

Banff Quantitative Criteria for Interstitial Fibrosis ('ci')[72]	
ci0	Interstitial fibrosis in up to 5% of the cortical area
ci1 Mild	interstitial fibrosis in 6-25% of the cortical area
ci2 Moderate	interstitial fibrosis in 26-50% of the cortical area
ci3 Severe	interstitial fibrosis in > 50% of the cortical area

Fibrosis can be important to assess in renal donor biopsies to predict subsequent allograft behaviour by the morphometric analysis [73]

In addition to the visual histological assessment, several morphometry techniques are being utilized as research tools to assess the IF. These include morphometry analysis of renal biopsy specimen slides stained with trichrome [74],Sirius Red, specific for collagen types I and III under polarized light and collagen immunohistochemistry, particularly type III collagen[75]. The Sirius Red dye molecule attaches to the tertiary groove in both types I and III collagen molecules and imparts a pink stain to the tissues when looked at in the white light. When observed under polarized light, collagen types I and III are strongly birefringent. Computer-assisted morphometry has shown good agreement with visual assessment methods

in the analysis of studies employing trichrome, Sirius Red, and collagen III immunohistochemistry. These studies have shown correlation of the morphometric assessment of interstitial fibrosis with glomerular filtration rate (GFR).

The objective measurement of IF has intrinsic limitations which include the sampling error associated with a sample obtained from a renal biopsy and assuming that it would represent the functional and anatomical architecture of the entire kidney. For example, in one study in which an interstitial fibrosis scoring was attempted in repeated biopsies estimated that repeat biopsies show a decrease in scores in 12% of cases [76]. The other inherent limitation of these methods is that they need an invasive procedure like renal biopsy to be performed to access a tissue for the assessment of the interstitial fibrosis

.

From the above we can infer that, there is no consensus regarding the best way to assess IF. There have been various studies attempting for a non invasive method for assessing the renal fibrosis. With the growing interest in the non invasive methods of assessment of the internal milieu of the human body there has been research in to the biomarkers in various body fluids for the predicting the extent and progression of the interstitial fibrosis of various organs. The most logical approach would be to look for the biomarkers in the urine for assessing the fibrosis in the kidney. Recent study to look at low molecular weight proteins as surrogate marker for the extent of interstitial fibrosis among which they found a significant correlation with urine retinol binding protein[77]. To bring this to practical utility will take further studies over a period of time for assessing its utility in routine evaluation and validation.

Meanwhile radiological imaging has been well utilized in assessing the fibrosis in the internal organs and a special mention has to be made for the utilization of percutaneous elastography technique of Acoustic radiation force impulse imaging (ARFI) in the assessment of liver

fibrosis [78,79]. This has been transformed in to a standard of care for the assessing the hepatic fibrosis and in many case acting as a screening tool before subjecting to an invasive procedure like liver biopsy. Before the proceeding to explore the utilization of these transcutaneous elastography techniques in the assessment of the interstitial fibrosis in the kidney we shall review the basic of ultrasound imaging and the various techniques of assessment of the tissue elasticity and their utility in the present era will be reviewed here.

History of Ultrasound

The earliest thought of ultrasound physics was given by Lazzaro Spallanzani from Italy [80]. The question of how bats could navigate at night and catch insects as they flew lead him to experiment by blindfolding them. He noted that they could still manoeuvre very well but when he plugged their ears he noted that they bumped into obstacles. He inferred that their primary mode of navigation was through sensing the echoed ultrasound waves to determine distance and direction of objects. He also proposed that these waves were not audible to the humans.

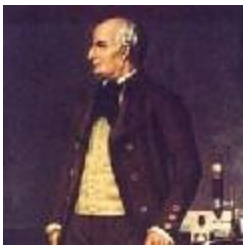

Figure 3. Lazzaro Spallanzani [picture downloaded from [80]

In 1826 Jean-Daniel Colladon introduced sonography with an underwater bell which was used to produce the sound waves. The subsequent development in the sonography technology was the introduction of Ultrasound transducers that use piezoelectric crystals which vibrate when stimulated with electricity [80]. The piezoelectric effect was described as a vibration response generated from multiple piezoelectric crystals (quartz) electronically interconnected

in Ultrasound transducers (or probes) to an applied electric current. This phenomenon was originally described by the Curie brothers in 1880 when they subjected a cut piece of quartz to mechanical stress resulting in generation of an electric charge on the surface [81]. The reverse piezoelectric effect is application of electricity to the quartz resulting in generation of the sound waves secondary to quartz vibration [82]. This the principle used to generate the ultrasonic waves by the transducers used in the current devices.

In the late 1930's an Austrian neurologist Dr. Karl Dussik, used the ultrasound pictures generated by the procedure called "hyperphonography" as a diagnostic tool to detect brain tumours. This was further improvised by Dr. George Luwig University of Pennsylvania in the late 1940's, who studied the difference in sound waves as they travelled through different tissues in animal studies [83].

Scottish, Ian Donald, from University of Glasgow, invented the B-mode scanner [84]. Later in 1950's and 60's Douglas Howry and Joseph Holmes improved on the B-mode scanner by inventing a transducer that was put in direct contact with the patient.

The sonographic imaging is free of radiation hazard, portable, without any teratogenic effects and relatively inexpensive when compared with other cross sectional imaging modalities, such as magnetic resonance and computed tomography. The images acquired in "real time," thus providing dynamic visual guidance for many interventional procedures including renal biopsy.

FUNDAMENTAL PRINCIPLES AND PHYSICS UNDERLYING ULTRASOUND TECHNOLOGY

Medical UltraSonography (US) in principle uses a pulse-echo approach with a Brightness-mode (B-mode) display [84]. This involves transmission of small pulses of Ultrasonic waves

from a transducer into the body. These waves traverse body tissues of different acoustic impedances along the path of transmission, some are reflected back to the transducer (echo signals) and some continue to penetrate deeper. The echo signals returned from many sequential coplanar pulses are processed and combined to generate an image.

The transducer functions as a source for wave generation as well as sensor for the echoed waves from the tissues. The direction of ultrasound propagation along the beam line is called the axial direction, and the direction in the image plane perpendicular to axial is called the lateral direction [84]. These mechanical sound waves create alternating areas of compression and rarefaction when propagating through body tissues. The physical attributes of the Sound waves are frequency, wavelength and amplitude measured as cycles per second or hertz, millimetre and decibel respectively.

Ultrasound of high frequency has a short wavelength as the wavelength and frequency of US are inversely related. The human audible range is from 20 – 20000 Hz and the waves above this frequency are called as ultrasonic waves and the waves below this range are called as infrasonic waves.US waves have frequencies beyond the upper limit for audible range for humans i.e., greater than 20 kHz[81].

The sound waves utilized in Medical ultrasound devices are in the range of 1–20 MHz The transducer frequency is an important aspect for adequate image resolution in the radio - diagnosis and for interventional guidance. High-frequency waves generate images of high axial resolution. The ability of the US to discriminate between two structures with good spatial and visual resolution will be enhanced by increasing frequency of the waves and in doing so increasing the number of cycles of compression and rarefaction of the waves for a given distance. On the other hand, the tissue attenuation of the high-frequency waves is more for a given distance making them appropriate for only imaging superficial structures [85]

On the contrary, lesser frequency wave put forward images of lower resolution but can go through to deeper structures due to less significant tissue attenuation. Thus in Nephrology higher frequencies are used for vascular interventions and relatively lower frequencies are used for abdominal cross sectional imaging.

The transducer using the piezoelectric effects generates ultrasonic sound waves in pulses that commonly emanates two or three sound cycles of the same frequency (**Figure 5).** The number of pulses emitted by the transducer per unit of time is pulse repetition frequency (PRF). The PRF should be such that there is enough time in between the sequential wave generation to allow the signal to reach the target of interest and sense the reflected echo before the next pulse is generated. The range of PRF for medical imaging devices is 1 to 10 kHz.

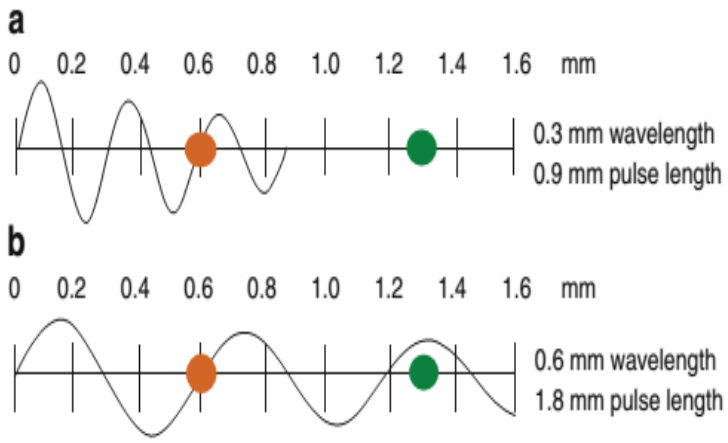

Figure 4: Attenuation of ultrasound waves and its relationship to wave frequency [86]

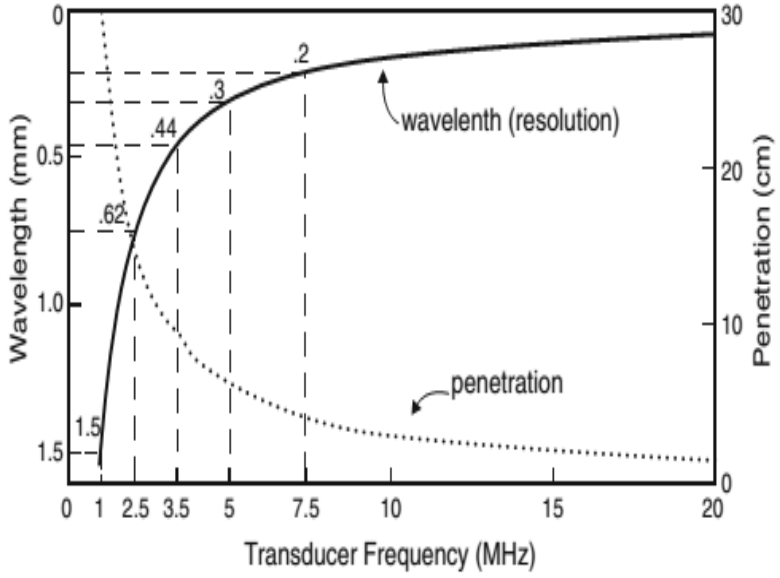

Figure 5: Comparative resolution and penetration of different ultrasound transducer frequencies

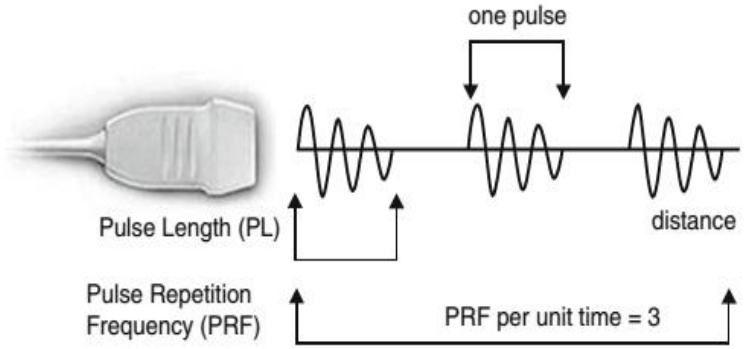

Figure 6: Schematic representation of ultrasound pulse generation [86]

The transmitted waves from the transducer with pass through tissues are in parts transmitted to deeper structures, scattered, or transformed to heat. Some of the waves are reflected back to the transducer as echoes, which are of interest for the imaging.

Acoustic impedance a tissue property determines the amount of echo returned after hitting a tissue interface. This is an inherent property of a medium or tissue defined as" the density of the medium times the velocity of US wave propagation in the medium". Organs such as the

lung which have air filled in them have the least acoustic impedance, whereas organs such as bone vowing to their high density have very high-acoustic impedance.

Table 4. Acoustic impedance of different body tissues and organs[86]

Body tissue	Acoustic impedance (10^6Rayls)
Air	0.0004
Lung	0.18
Fat	1.34
Liver	1.65
Blood	1.65
Kidney	1.63
Muscle	1.71
Bone	7.8

The difference in the acoustic impedance between two mediums is proportional to and will be reflected in terms of intensity of the image [87].

UTILITY OF ULTRASOUND IN NEPHROLOGY

Ultrasound imaging has become vital to the management of renal disease. The predominant modality used is the brightness (B)mode .One of the basic utility is to rule out the obstructive causes of the renal dysfunction as the fluid is well visualised due to poor acoustic attenuation. The other most common use is measurement of renal size, though subjective to operator dependent variability still is a good and reliable guide. At the same time it gives a rough estimate of the evidence of renal parenchymal disease by providing the ability to demarcate the cortex and medulla and their relative acoustic impedance depending on the extent of the progression of the disease.

The current standard of care for performing the renal biopsy involves the use of the ultrasound guidance. The relative ease of use makes this as an essential part of management of renal diseases. On the other hand the disadvantages include the subjective nature of the imaging being operator dependent, acoustic interference from intervening structures between the tissue of interest and the probe and lack of proper visualization for most of the ureter.

In addition to the anatomical imaging which included the structural changes in the parenchyma as well as the renal collecting system including the ureter, over the last few decades the functional imaging with the use of the colour Doppler innovation in the ultrasound imaging has involved the evaluation of the renal vasculature and the implications of the ultra structural changes in the renal parenchymal disease on the vascular hemodynamics were well studied and has been able to guide the further evaluation by the acting as effective screening investigation. Thus, US and Doppler techniques in addition to morphologic, information provide functional information on altered blood and in patients with renal diseases and the renal vascular anomalies.

RECENT ADVANCES IN THE ULTRASOUND IMAGING TECHNOLOGY AND THEIR RELEVANCE TO THE NEPHROLOGY AND FUTURE IMPLICATIONS

The past two decades witnessed considerable technical improvements within the equipment and new technologies in terms of transducer sensitivity, the beam formation, the speed of processing of imaging and the quality of the final image display which allowed ultrasound to penetrate every field of medicine. The equipment became smaller, power efficient with less heat generation. These advances, together with enhancements in image resolution, have turned it into the point-of-care investigation in most setting including emergency rooms, obstetric practices.

These advances have improved the image quality in B-mode imaging than what it was a decade ago. This has transformed in to Physicians visualising things that are smaller and a lot deeper than was earlier possible including the microvasculature of the organs of interest which lead to utilization of B mode imaging in interventional procedures being performed in real time.

Volumetric Ultrasound

Volumetric ultrasound has improved to the extent that multi-planar images are possible with current imaging with which we are able to acquire the volumes in real time. This multi-planar imaging also helps plan any intervention better with increased accuracy and help in reducing rate of complications. The volumetric assessment may also help in the monitoring the anatomical lesions for the rate of progression as in ADPKD [88] with cystic lesions and the longitudinal follow up of the complex cyst as assessed with anatomical attributes with a potential for transformation to malignancy.

Newer Technology in the ultrasound imaging

The recent innovations that are set to change the perception of ultrasound practice include the sonoelastography, and contrast enhanced ultrasound imaging .The sonoelastography has been in evaluation for almost two decades, utilizes the same machine that does B-mode ultrasound to measure tissue stiffness. The mechanical characteristics of tissues are estimated and are represented as an overlaid variable on the routine B-mode ultrasound image.

SONOELASTOGRAPHY – AN INNOVATIVE BRANCH OF NON INVASIVE IMAGING

This technology is aimed at a virtual method as a substitute for the art of palpation in the clinical examination with the help of the ultrasound waves with increased sensitivity and specificity with an additional accuracy in delineation of the essential pathologies behind the altered tissue consistency.

Quantitative assessment of the tissue elasticity has been practiced since ancient times with palpation of the tissues. Shear elasticity modulus of tissue is a physical property of a tissue which is very sensitive to structural changes secondary to normal physiological process such as aging and disease conditions.

The earliest mention of tissue elasticity as measure parameter was made in the In the book "Physical Principles of Medical Ultrasonics" published in 1986 [89] written by Kit Hill which has a chapter titled "Telehistology", where he described the ideas which are now forming the foundation of Elasticity Imaging.

He defined "telehistology" as "the description of a defined region of a target tissue or organ in terms of 'features'…that can be quantified by remote means – in this case ultrasound[89]." Of many features described by Hill most relevant for the tissue elasticity was tissue motion. Hill accurately defined all primary techniques used in modes of elasticity imaging currently in practice for inducing the strain necessary for elasticity assessment.

He describes four types tissue movements:" primary (e.g. cardiac or foetal limb movement), secondary (e.g. movement of liver tissue in response to pulsation of a neighbouring major blood vessel), fluid flow (particularly blood flow), and externally induced movement."

One of the methods for generating the stress for remote probing tissue elasticity was acoustic radiation force [90,91]. Acoustic radiation force is defined as the "time-average force exerted on an object by an acoustic wave".

BIOPHYSICS OF ELASTICITY IMAGING: INTERPLAY BETWEEN MECHANICAL CHARACTERISITICS AND CONSTITUTION OF SOFT TISSUE

The mechanical tissue characteristics when viewed as a system consists of several parameters like shear and Young's moduli, bulk compressional modulus, Poisson's ratio, viscosity, nonlinearity poro-elastic parameters, anisotropy and heterogeneity indices, etc.

In a gross simplification to say that among the many characteristics mentioned the one with most relevance for the medical use is the young modulus. It describes the tissue consistency with best correlation with the composition of the tissue and might be considered adequate to address most diagnostic tasks. One should bear in mind that the level of appropriate simplification in characterizing a tissue biomechanics might be one of limitation for a total reliance of these imaging modalities in clinical diagnosis.

The term "elasticity" and "stiffness" are the mechanical characters most closely correlating to a rigorous physical parameter – Young's modulus, E. Detection of heterogeneity of the organ consistency by manual palpation is based on sensing the distinction of the Young's modulus of tissue.

Bulk compressibility and shear elasticity are dependent on different characteristics of tissue. Bulk compressibility modulus is defined mainly by tissue molecular composition and depends on short range molecular interactions and while shear elasticity is defined by structural uniqueness of tissue, its cellular and spatial design [92]. As water constitutes the

bulk of tissues, bulk modulus of tissues predominantly is contributed by the water content of the tissues, and the consequential interplay of atomic groups of organic substances with water. The range of diversity of structural features of tissues, such as geometrical parameters of the cellular architecture and anisotropy, are incomparably greater.

Local viscoelastic properties of tissue may also be evaluated from the data on tissue motion induced by a radiation force impulse in the focal region of the focused ultrasound beam, which is the basis of Acoustic Radiation Force Impulse (ARFI) imaging.

ELASTICITY IMAGING(EI) METHODS

Almost all elasticity imaging methods encompass two essential components: the application of a stimulus and the measures to estimate a mechanical response consequent to it.The measure of mechanical response can be estimated by using differing modes of imaging like, X-rays, Magnetic resonance imaging (MRI), ultrasound imaging.The follwing description deals with some of modalities of the tissue imaging using the ultrasound imaging which has proven clinical use.

ACOUSTIC RADIATION FORCE IMPULSE (ARFI) IMAGING

The impulsive force stimulates a focal dislocation of soft tissue.The tissue relaxes after cessation of the force to its native configuration.This tissue dislacement to the force can be characterised by many parameters, which include peak displacement, the time taken for peak displacement, and time for the recovery [93]. There has been good correlation of peak displacement with the inverse of the modulus [94]. These displacments are used to construct images representative of tissue responses .The signals from stimulation and detection are analysed to build up images of the tissue response [95]. This process can be done simultaneously to push and track the tissue alterations simultaneously [96].

TRANSIENT ELASTOGRAPHY (TE)

In Transient Elastography (TE) the source of stimulus is an external actuator to generate a single cycle of lowfrequency (50 Hz) and track the resulting motion. This type of stimulation leads to generation of compressional wave and shear wave which can be distinguished temporally because of relative difference in the wave speeds as longitudinal wave is faster than the shear wave [97].

Motion estimation is performed using cross-correlation of generated radiofrequency data which has been studied and optimized [98].Early measurements of shear waves produced by mechanical actuation were reported by Dutt, et al [99].

The other modalities of elastic imaging are Shear Wave Elasticity Imaging (SWEI)supersonic shear imaging (SSI),Vibro-acoustography (VA), Harmonic Motion Imaging (HMI), Shearwave Dispersion Ultrasound Vibrometry (SDUV), Magnetic Resonance Elastography (MRE), Endogenous Motion Imaging and Mechanical Imaging (MI) and these are in various stages of development of the clinical uitiltys.

PROS AND CONS OF ELASTICITY BASED IMAGING METHODS

These most modalities of this imaging are designed to achieve the same objective of quantifying the viscoelasticity of tissue ,each one of them has their individualised variations in techniques and as the elasticity properties of tissue are dependent on the frequency which it self varies from nearly stastic to dynamic with frequency content (up100 KHz) of the stimulating wave which when comparing quantitative variables generated by various modalities warrants caution.

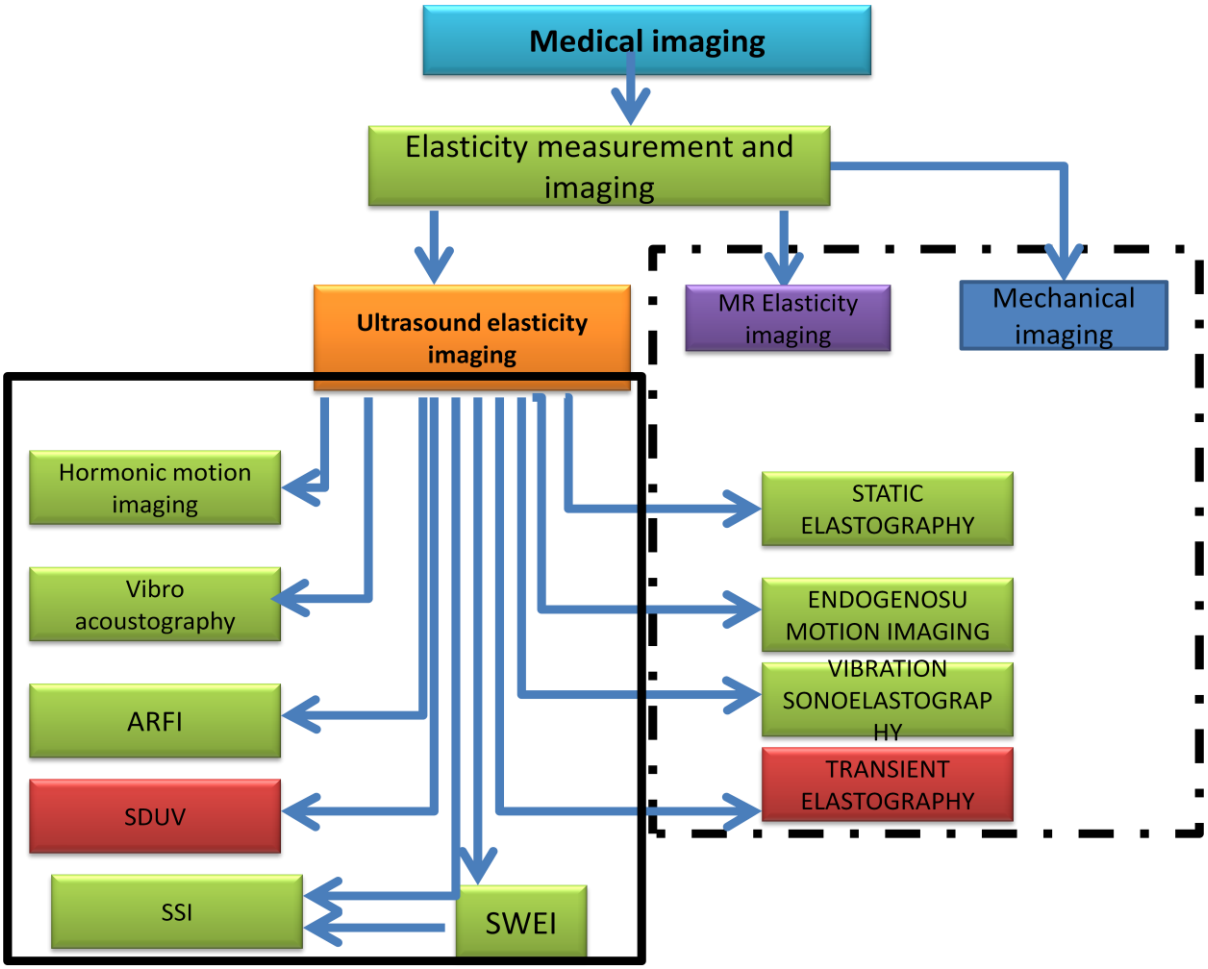

Figure 7. Various modalities of tissue elasticity imaging

A comparitve of the excitation and measurement methods and some advantages of each elasticity imaging utilising the ultrasound method are listed in **Table 4**

ARFI, SWEI, SSI, VA, HMI, and SDUV use ultrasound radiation force to create displacement or shear waves. Only one ultrasound probe is necessary to create the vibration and assess the resulting alteration of the viscoelastic properties and wave propagation . However, because of limits on the intensity used to avoid both mechanical and thermal bioeffects [90,100], the resulting motion amplitude of the shear waves is usually below 20μm.

Table 5 .Comparisof of shear wave based ealsticity measurement and imaging methods

Method	Excitation		Modality	Routine Machine	Advantage
	Time Course	Stimulus			
Elastography	Quasistatic	Mechanical	**US**	yes	Full strain and modulus images estimates elastic nonlinearity
ARFI	Dynamic	Radiation Force	**US**	yes	Viscoelastic char acterisation
HMI	Dynamic	Radiation Force	**US**	No	Viscoelastic characterisation
Endogenous Motion Imaging	Dynamic	Endogenous	**US**	No	Mechanical Wave imaging
TE	Dynamic	Radiation Force	**US**	No	Simple,inexpensive
Sono elastography	Dynamic	Radiation Force	**US**	yes	Fulla elasticity images
SWEI	Dynamic	Radiation Force	**US /MRI**	No	Remaote palpation
SSI	Dynamic	Radiation Force	**US**	No	Full elasiticity images
SDU	Dynamic	Radiation Force	**US**	No	Viscoelastic characterisation

A major limitation of radiation force methods is inability to produce the stimulus to generate sufficient displacement beyond depth of 6 cm with current imaging systems.The shear wave attenuation generated by the ultrasound imaging is very high so the waves will not transmit very far form the region of interest which is an gain interms of speicificity as the shear waves generated are less susceptible to artifacts from other tissue boundaries [90] ensuring a more localized elasticity measurements.

However the desirable features of imaging such as enhanced resolution, least bias and variance errors and realtime image formation are always in the wishlist of the tactile imaging techniques which would require further reseach in to this feild of tissue dynamics.

CLINICAL APPLICATIONS

From largely research tool the elastography imaging, with a wide spread availability in the new machines of ultrasound imaging has transformed in to an experimental and in some of the clinical situation as an effective screening tool as exemplified by the use of ARFI in heaptic fibrosis assessment .

The vast accessibility of Elastography has increased interest in large numbers of researchers to try it on different tissues and lesions that were not initially thought as candidates for elasticity imaging. A search of the current literature shows that EI is tried in most of the tissue which are accessible to the ultrasound imaging and some of the deeper tissues have also been evaluated with the help of ultrasound waves with more tissue penetration or other modalities of imaging like Magnetic resonance. Most of the experimental applications are still in the early stages of research, but a few are making foray in to common applications in clinical practice.

BREAST:

This was the first tissue to be studied systemically with elasticity imaging . studies demonstrated an area under the receiver operating characteristic(ROC) curve (Az) values ranging from 0.89 to 0.95 for distinguishing non malignant from malignant lesions [101].

LIVER

The widespread application of elasticity imaging is for the assessing the of hepatic fibrosis as a mraker of the advanced chronic liver disease[102]. FibroScan® from Echosens is most commonly employed for assessing the heaptic fibrosis**.** With the area under the ROC of 0.84—0.89 for heaptic fibrosis with the good correlation with moderate to severe fibrosis.This has lead its inclusion in to routine evaluation of chronic liver disease.

PROSTATE

The elasitiy technique which can guide at targeting the foci for tissue sampling in prostate biopsy[103]. The second application with probable clinical use is the post ablation monitoring of malignant lesions [104].

GRAFT REJECTION:

The allograft rejection in most of the solid organ transplants involves inflammation and fibrotic change, which together increase tissue stiffness. Hence imaging targeted at evaluation of the tissue elasticity is a reasonable diagnostic modality to assess the tissue architecture of renal and other solid organ transplants. Liver transplant fibrosis seems to correlate with fibrosis scores using the FibroScan® device [105]. This scan was used to evaluate kidneys in transplant recipients with a clinical success rate (96.5%) with a positive relation of stiffness with increased interstitial fibrosis. It demonstrated marked distinction in elasticity measurement values in patients with low estimated (GFR) in distinction to those with GFR values more than 50 ml/min [106]. The literature generated with regard to utilization of elasticity imaging of kidney allograft recipients are being published more frequently. Though the initial results were not promising [107,108] the subsequent studies have shown positive results emphasising the need for larger studies.

NATIVE KIDNEYS

Taking a lead from the renal allograft studies [109,110], ARFI, has been performed to assess the tubulointerstitial fibrosis in the native kidneys. These studies have shown a significant correlation between the tissue shear wave velocity and the level of fibrosis in the renal biopsies.

Elasticity imaging methods are promising as commercial applications, a true witness to the progress of the field in medical arena. The ARFI imaging has been implemented as the

Virtual Touch imaging and Tissue Quantification, respectively, in the Siemens S2000 (Berlin, Germany) ultrasound scanner.

In summary, the viscoelastic tissue properties of can be used as signature for characterisation of the tissues using the elasticity imaging methods. This would help in evaluation of various disease states which modify viscoelastic properties of a normal to a distinct phenotype in diseased states from various aetiologies. The application of this imaging modality holds a lot of promise as a non invasive and easily repeatable modality in identification of disease and their severity.

AIMS AND OBJECTIVES

Primary objective:

To study the correlation between non-invasive ultrasound based shear wave velocity (SWV) by acoustic radiation force impulse (ARFI) and semi-quantitative histopathological renal fibrosis scoring among patients undergoing diagnostic renal biopsy of native kidneys.

Secondary objectives:

- To identify clinical predictors of the degree of interstitial fibrosis in renal tissue
- To ascertain the correlation between the radiological parameters of the kidney and extent of interstitial fibrosis in renal tissue

Materials and Methods

Type of study: Prospective observational cohort study approved by the Institutional review board

Setting and location: Department of Nephrology, Radiology and Pathology, Christian Medical College, Vellore-632004.

Participants: Consecutive consenting patient who are planned and willing to undergo a diagnostic renal biopsy as per treating nephrologists' advice in Department of Nephrology, Christian Medical college, hospital during a period of august 2013 to January 2014.

Inclusion criteria

Consecutive consenting patients who had been advised a renal biopsy by the treating Nephrologists and willing to give consent for their participation in the study.

Exclusion criteria

Age <15 and >75 yrs

Prior history of any urological intervention on the native kidneys

Data Sources/measurement:

History and treatment details (current and past) are noted from the chart records.

Blood pressure, height, weight, BMI, age, gender and other demographic details are noted from the chart records.

Serum creatinine, albumin, uric acid, cholesterol, LFT, Urine analysis & microscopy, 24 hour urine protein, USG parenchymal echogenicity and other investigations are noted from clinical work station.GFR is calculated with use of creatinine from lab reports, age and sex

Shear wave velocity to be assessed by ARFI scan

Fibrosis scoring and histological diagnosis from the pathology biopsy reports on clinical work station

Study algorithm

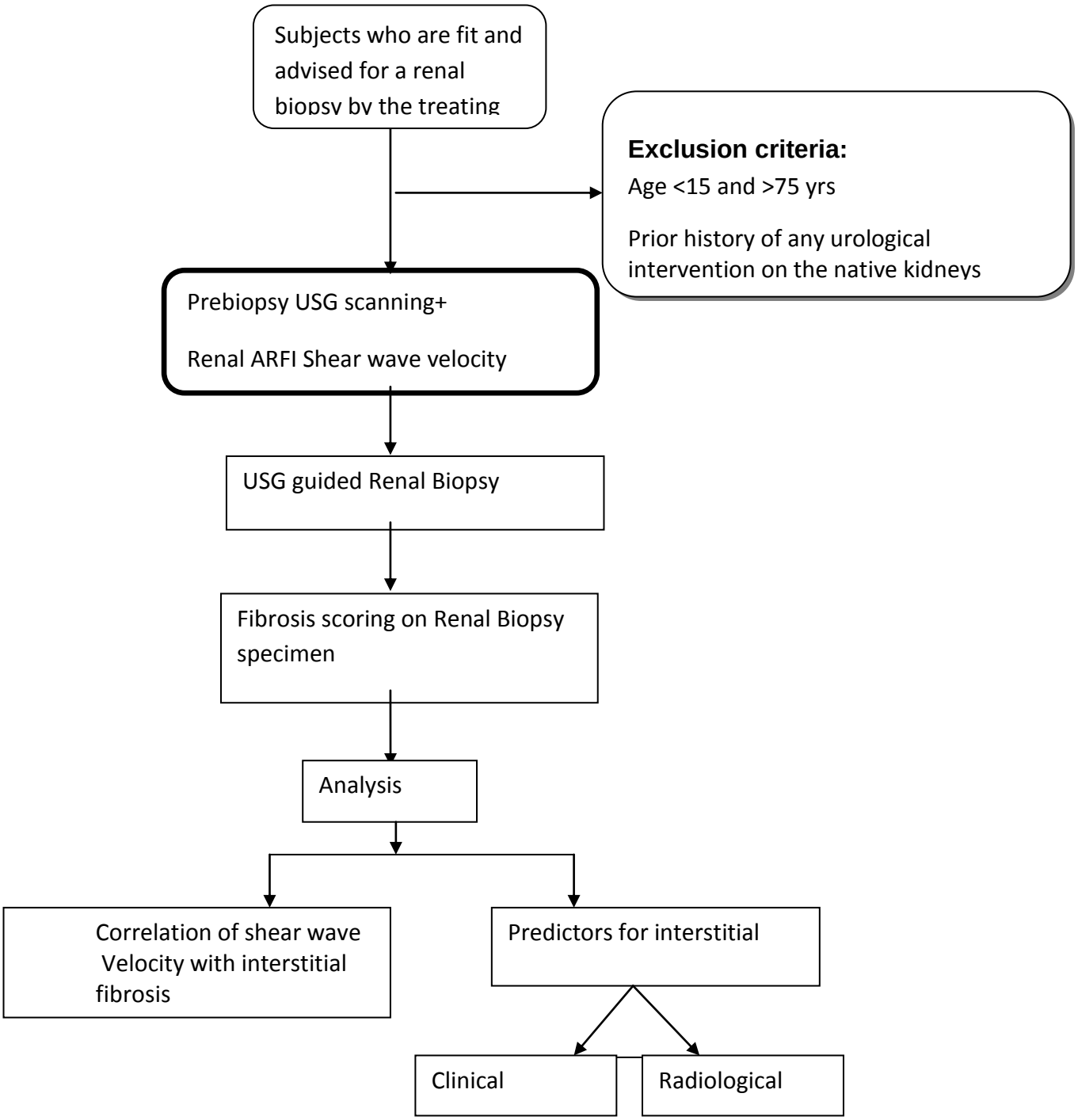

Figure 8. Study design

Methods and Definitions used in the study:

1. Estimated glomerular filtration rate (eGFR) was calculated with abbreviated Modification of Diet in Renal Disease (MDRD) equation:

   eGFR (mL/min/1:73m^2) =186xserum creatinine (mg/dL)$^{-1.234}$ x age (years)$^{-0.179}$X (0:79if female)

2. Routine evaluation which included a urine analysis, renal function test and other relevant serum chemistry test and the immunological investigation as indicated by the clinical presentation. The measurement of the renal sizes in the longitudinal axis and a documentation of the echogenicity were done with as part of routine evaluation.

3. Shear wave velocity measured by Radiologist using the US Acuson S2000 ultrasound system (Siemens Medical Solutions), ARFI technology incorporated in to it. The SWV are generated by with patient in prone positions and focussing the region of interest box over the lower pole of the kidney. Five valid measurements of the quantitative variable for the SWV are generated on either kidney or a mean SWV is calculated by the virtual touch tissue quantification by the ultrasound machine. The radiologist was blinded to the initial diagnosis and the renal functions of the participants

   The measurements are taken with patient holding the breath at the time of acquisition of the shear wave velocity. The sound beam was maintained as perpendicular as possible. A total of five values for each kidney lower pole were obtained and the mean and the median ARFI values and the standard deviation were also obtained and recorded. The inter-quartile range was also obtained to assess the variation of the measurements obtained during the imaging.

These were recorded in predetermined pro forma used for the assessment of the liver fibrosis with the “Liver segment 1” measurements representative of the right kidney and the “Liver segment 2” measurements representing the left kidney. The measurement were localised to

the lower pole as the renal biopsy is almost always done in the lower pole

Figure 9 Measurement of Shear wave velocity by the ultrasound probe in prone position

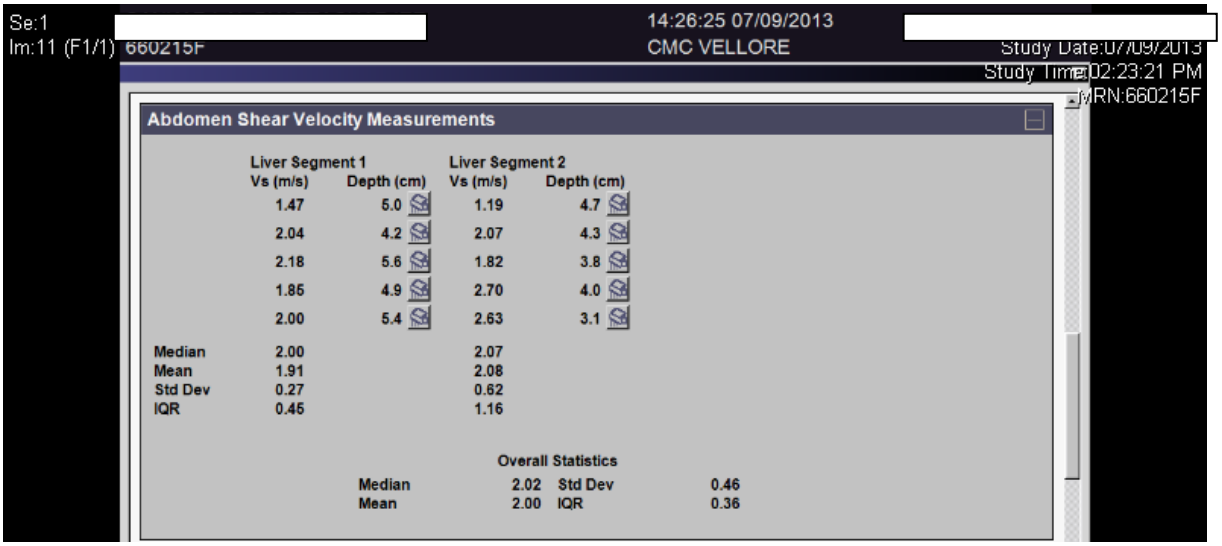

Figure 10. Data of Shear wave velocity in the pro forma "*Liver segment 1*"represents the right kidney and the "*Liver segment 2*" represent left kidney

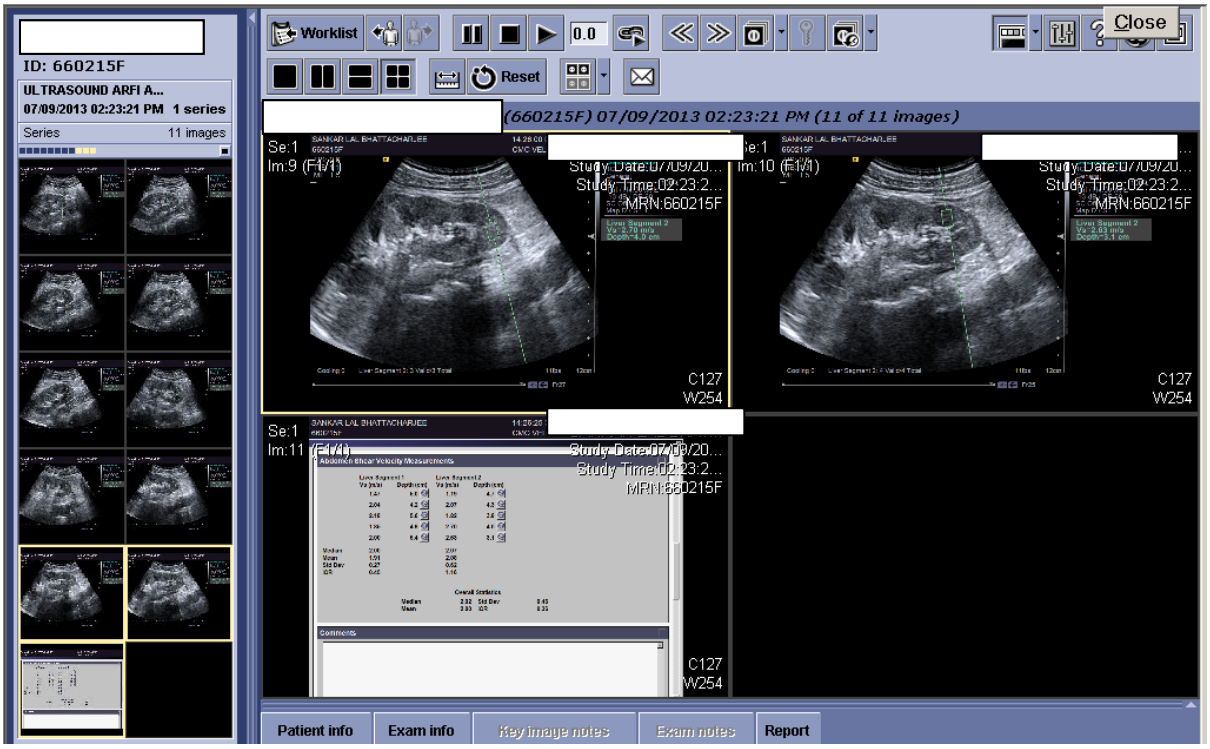

Figure 11. Data recording on the electronic medical records

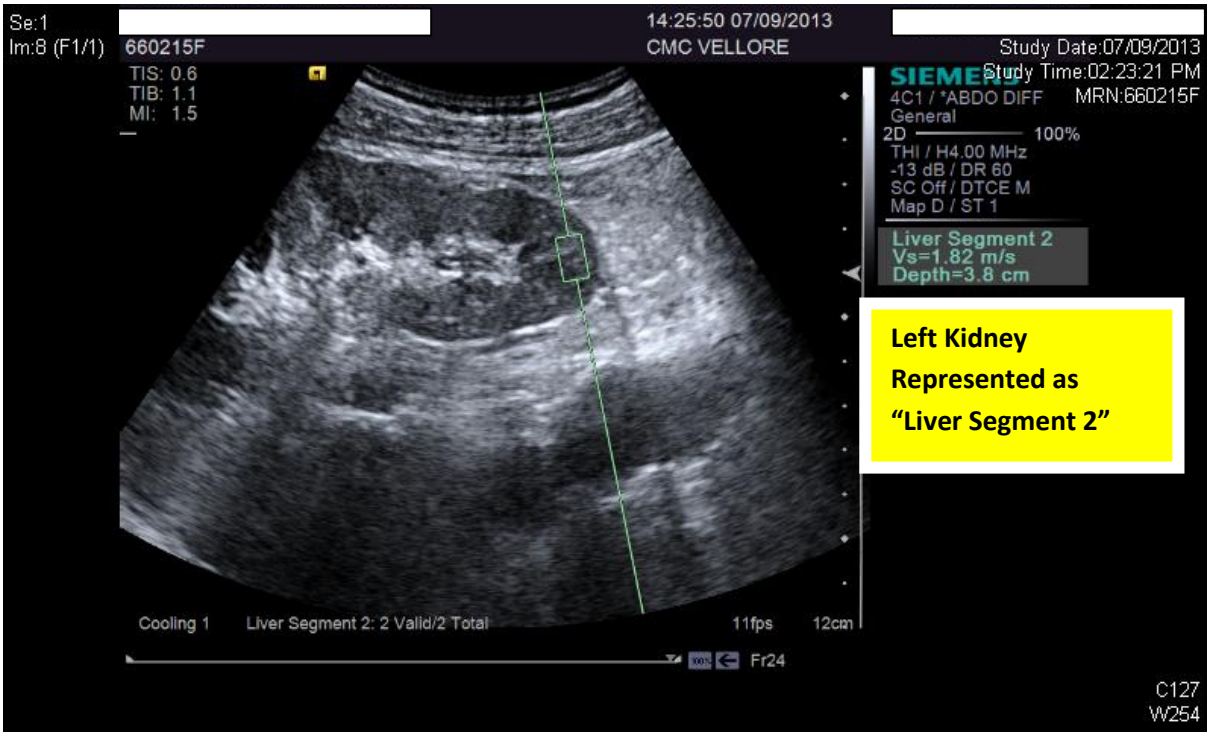

Figure 12. Depicting the region of interest (ROI) in the lower pole of 1 cm x0.6 CM in the left Kidney Labelled as "*Liver segment 2*"

RENAL BIOPSY

Once SWV are obtained has been completed the patients were taken up for renal biopsy after obtaining a separate consent for the renal biopsy as part of the routine protocol of the hospital before any invasive procedure. The participants were thoroughly acquainted with the procedure, the local anaesthesia used for the procedure and the associated risk of renal biopsy procedure is explained. After the participant has understood the complications involved in the procedure they were subjected to the renal biopsy.

INTERSTITIAL FIBROSIS SCORING

Interstitial fibrosis scoring was used for assessment of the fibrosis on the renal biopsy specimen using trichrome staining for the collagen. The fibrosis scoring was done by the pathologist and it was scoring percentage of the medulla with fibrosis and participants were grouped in to three class based on the scores of fibrosis which were $\mathbf{i_1}$ (<25%), $\mathbf{i_2}$ 25-50%and $\mathbf{i_3}$>50% .The pathologist was blinded to the clinical data of the participants.

The samples for routine histopathological assessment were sent in a formalin bottle for fixation and the samples for the immunofluorescence are sent in saline as a preservative. The formalin fixed samples are subjected to the procedure like fixing and slicing and then are stained as per protocol with the haematoxylin and eosin stain for assessment of the cellular architecture and, PAS for the tissue architecture and the extracellular matrix. Special stains like the Masson's trichrome for the assessment of the collagen content of the specimen and Jones methanamine silver for assessment of the basement structures of the glomerulus and the tubules.

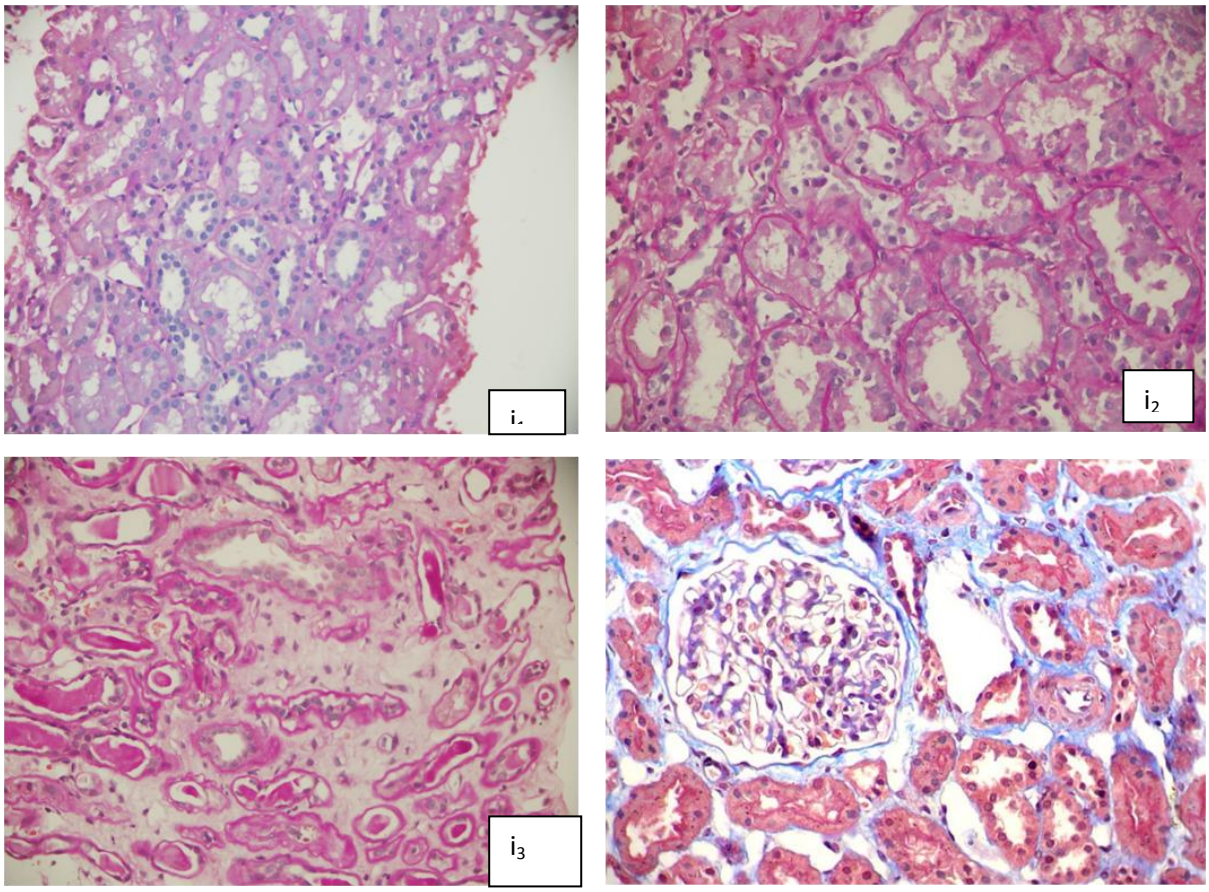

Figure 13.Hamotoxycillin and eosin stains showing different grades of fibrosis and Masson trichrome stain for assessing the renal interstitial fibrosis

The renal biopsy specimen slides are assessed by the pathologist and a scoring are uploaded on the electronic medical records. The pathologist was kept blinded to the ARFI scores and the clinical data.

Methods to minimize bias:

Cases were indicated with unique protocol ID and not with patient's name or hospital number. Radiologist assessing the ARFI score is blinded to the renal function and Proteinuria of the patients. Pathologist scoring, the renal fibrosis were blinded to the ARFI score and renal imaging.

STATISTICAL ANALYSIS

Sample size calculation was done assuming a difference of 0.5 in ARFI between the grade i_1, i_2 and i_2 with 5% α-error with 90% power with sample size of 30 in each arm.

Table 6. Sample size calculation for study

	Grade 2 Vs 3_diff=0.5	Grade 2 Vs 3_diff=0.3
Standard deviation in group I	0.53	0.53
Standard deviation in group II	0.66	0.66
Mean difference	0.5	0.3
Effect size	0.840	0.504
Alpha error (%)	5	5
Power (1- beta) %	90	80
1 or 2 sided	2	2
Required sample size per group	30	63

Statistical analysis was done with the SPSS version 11.0 software .The continuous variables were expressed as mean±SD .The Pearson's correlation was used to look for relation between the clinical and radiological characteristics which were thought to have an influence on the structure and the composition of the kidneys. Correlation between SWV and variables (such as eGFR, creatinine) were analyzed with Pearson's correlation.

One-way analysis of variance (ANOVA) test was used to look for utility of the SWV to differentiate between different stages of CKD in the study. An independent t-test was used to analyze the differences in SWV between two different groups. The P value, 0.05 was taken as statistically significant. For the assessing the clinical predictors of interstitial fibrosis independent t test and Pearson correlation were used.

OBSERVATIONS AND RESULTS

Study descriptive algorithm

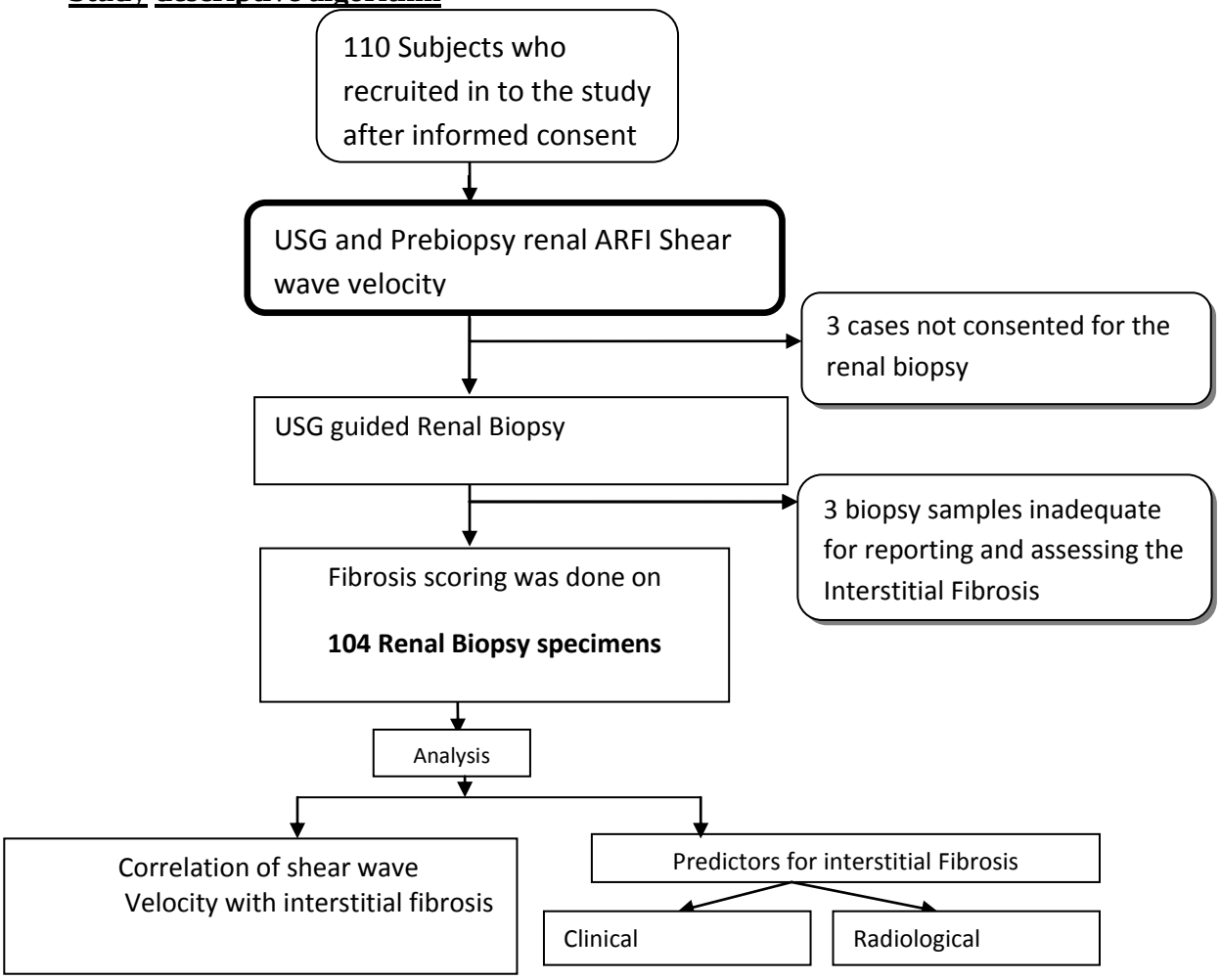

Figure 14. Study Algorithm

Study population: The study population (n=104) included 73.08% males with a male to female ratio of 2.7:1 with mean age for males and female participant being 41.41±13.8 and 32.07±13.59respectively. The mean height and weight of the study population was 162.14±7.94 cm and 62.70±12.76 with a mean BMI of 23.83±4.3. The mean haemoglobin and 24 hr urine protein were 11.43±2.1 and 3265 mg respectively with a mean serum albumin level of 3.34±1.03.The mean size of the kidneys were 9.99±1.1 cm on the right side and 10.23±1.23 cm on the left side.

Table 7.Baseline characteristics of study population

Characteristics	Mean	Std. Deviation
eGFR*(MDRD)	57.31	40.06
eGFR *(CKDEPI)	57.62	39.57
SCr (mg/dl)	2.49	2.61
Age(yrs)	38.50	14.26
Height(cm)	162.14	7.94
Weight(Kg)	62.70	12.76
BMI	23.83	4.31
Haemoglobin(mg/dl)	11.43	2.12
24hrUP(mg/day)	3265.12	3540.71
Sr.albumin(gm/dl)	3.34	1.03
US size Rt(cm)	9.99	1.10
US size Lt(cm)	10.23	1.23
SBP(mm of Hg)	130.40	11.86
DBP (mm of Hg)	90.69	71.50
%Glomerulosclerosis	26.08	29.84
Tubular Atrophy scoring#	1.23	0.91
Interstitial fibrosis scoring	45.86	22.96

***ml/min/1.73 m^2,#T_0 25, T_1<25-50%, $T_2$50-75, $T_{3>}$75**

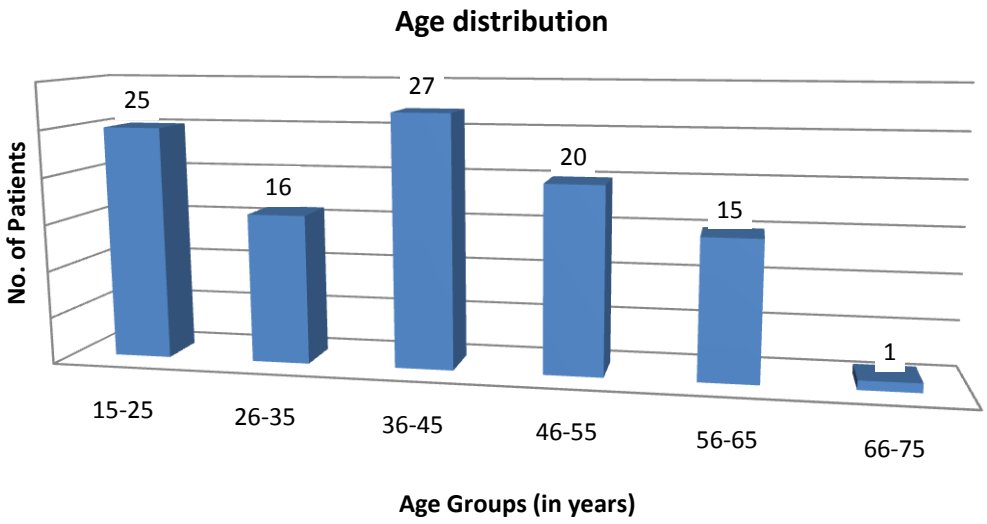

Figure 15. Bar chart showing age distribution in the study population

Baseline characteristics according to stage of CKD: The mean e GFR (ml/min/1.73 m^2) in the study population as a function of the CKD staging was 117.49±26.37 in stage 1, 75.68±8.69 in stage 2, 42.94±8.53 in stage 3, 23.21±4.71 in stage 4 and 6.96±2.57 in stage 5

Table 8.Baseline characteristics according to CKD stages

Characteristic Mean ±SD	CKD 1 N=23	CKD 2 N=17	CKD 3 N=33	CKD 4 N=21	CKD 5 N=10
Age(yrs)	27.52±15.3	42.81±12.4	49.9±12.8	38.66±10.5	40.9±14.3
Females (%)	43.5	17.6	21.2	23.8	30
Height(cm)	158.96±8.2	162.19±7.2	162.00±6.7	163.67±8.3	163.90±9.4
Weight(Kg)	54.82±13.4	63.18±10.0	62.00±10.	70.18±14.	66.52±7.0
BMI	21.76±5.4	23.95±3.1	26.14±4.4	26.14±4.4	25.05±3.2
MDRD eGFR*	117.49±26.37	75.68±8.69	43.00±8.55	22.97±4.68	6.96±2.57
CKDEPI eGFR*	116.23±18.75	80.61±12.7	43.30±8.3	21.75±4.3	4.31±2.34
HTN (%)	43.5	47.1	84.8	90.5	100
DM (%)	8.7	11.8	27.3	14.3	20
Edema (%)	78.3	76.5	45.5	47.6	90
Hematuria (%)	34.8	29.4	36.4	33.3	60
Creatinine (mg/dl)	0.79±0.16	1.08±0.17	1.81±0.3	3.25±0.69	9.27±3.36
Urea(mg/dl)	27±30.1	23.7±6.0	40.81±15.6	70.5±23.05	150.2±51
Haemoglobin(gm/dl)	12.8±1.9	11.3±1.8	11.75±2.1	10.7±1.4	9.0±1.03
Serum Albumin(gm/dl)	2.36±0.98	3.00±1.02	3.80±0.84	3.78±0.69	3.57±0.53
Right Kidney (cm)	10.5±0.8	10.4±0.6	9.54±1.2	9.73±1.1	9.58±0.5
Left Kidney (cm)	10.86±0.88	10.49±0.9	9.86±1.2	9.8±1.3	10.03±1.2

* **In (ml/min/1.73 m^2) HTN Hypertension, DM Diabetes mellitus**

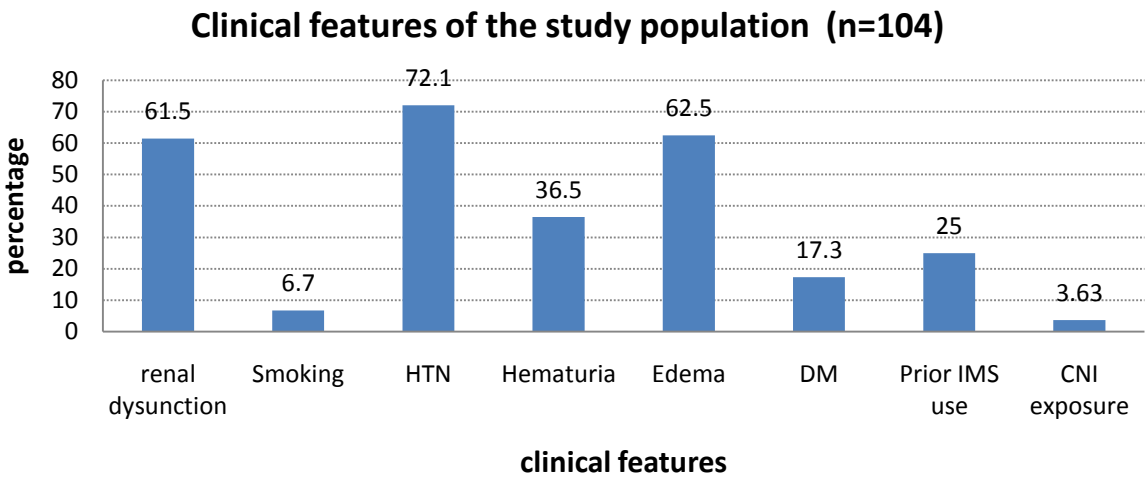

Figure 16.Bar diagram representing the clinical characteristics of the study population

Comorbidites like Hypertension and Diabetes were present in 72.1 % and 17.3 % of the participants. Only 7 among the study population gave a history of smoking. 61.5% of the participant has renal dysfunction defined as eGFR < 60 ml/min/1.73 m^2 was the most common presenting symptom followed by the oedema (62.5%) and hematuria (36.5%). There were 3.63% participants with prior exposure to calcineurin inhibitors. 25 % had prior exposure to immunosuppressive medication and predominantly received steroids.

PREBIOPSY RENAL SYNDROMES

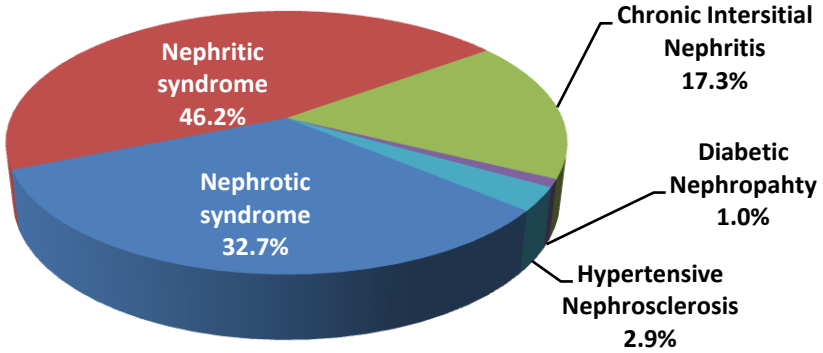

Figure 17. Clinical renal syndrome in the study population

Nephritic syndrome (46.2%) was the most common presentation followed by nephrotic syndrome (33%) and chronic interstitial nephritis (17%). Diabetic nephropathy was only suspected in 1 % of the population..

Distribution of the final diagnoses in the study population:

The most common diagnosis was the primary glomerulonephritis (75%) with IgA and proliferative GN being major contributors. Diabetic Nephropathy was seen in 7.7% cases.

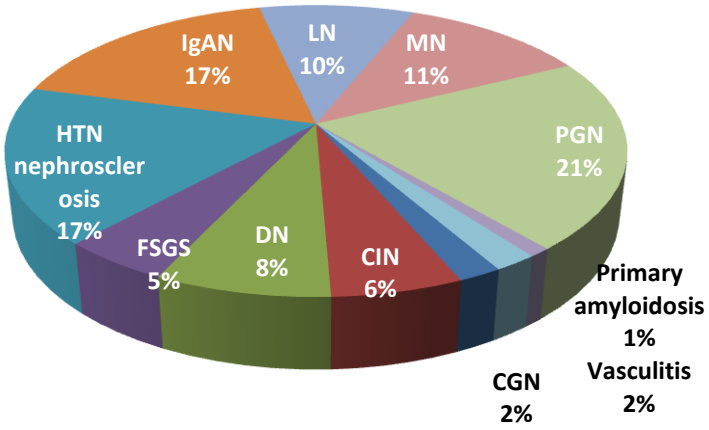

Figure 18. Final diagnosis in the study population

HISTOLOGICAL CHARACTERISTICS

The mean interstitial fibrosis scoring was 45.85±22.9 with 85% in the i_2 and the i_3 .The t_1, t2 and t_3 groups outnumbered t_0. Overall the study population had a higher proportion of the interstitial fibrosis and tubular atrophy.

Table 9. Frequency in the IF classes i_1,i_2 and i_3 and Tubular aatrophy grades

Interstitial Fibrosis Scoring			Tubular Atrophy scoring		
Groups	**Frequency**	**percent**	**Groups**	**Frequency**	**percent**
i_1 ,<25%	19	18.27	**T0**,<25%	27	26.0
i_2, 25-5%	40	38.46	**T1**,25-50%	32	30.8
i_3, >50%	45	43.27	**T2**,50-75%	39	37.5
			T3, >75%	6	5.8

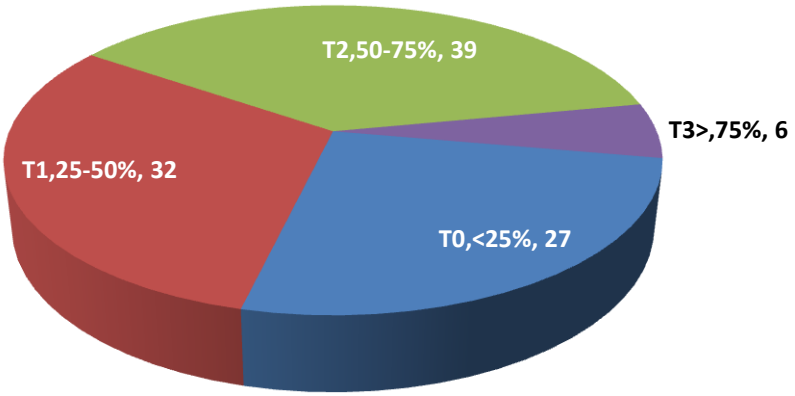

Figure 19. Distribution of the tubular atrophy

Radiological characteristics in the study population

Correlation of ARFI with interstitial fibrosis (IF)

The mean SWV were distributed normally in the study population

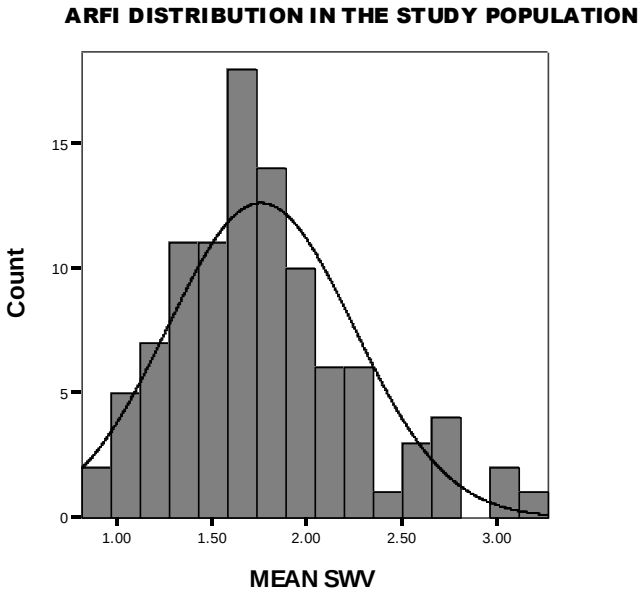

Figure 20.Histogram representing the normal distribution in study distribution

The mean and the median Shear wave velocity (SWV) in CKD stages is represented in following table

Table 10. Mean eGFR and mean shear wave velocities according to the CKD staging

STAGE	eGFR ml/min/1.73 m2±SD	Mean SWV±SD	Median SWV±SD
1	117.49±26.37	1.73±0.59	1.67±0.64
2	75.68±8.69	1.78±0.34	1.73±0.39
3	42.94±8.53	1.82±0.51	1.73±0.51
4	23.21±4.71	1.94±0.86	1.77±0.97
5	6.96±2.57	1.80±0.53	1.74±0.57

Table 11a Univariate analysis for association of Mean SWV with clinical features.

CHARACTERISTICS	SWV (Mean ±SD)		P value
	YES	NO	
Sex(F)	**2.073±0.64**	**1.707±0.45**	**0.009**
Smoking	1.631±0.28	1.818±0.54	0.157
Hypertension	1.771±0.56	1.896±0.44	0.157
Diabetes	1.733±0.45	1.821±0.54	0.527
Hematuria	1.896±0.57	1.754±0.50	0.192
Edema	1.879±0.60	1.683±0.36	0.412
CKD Stage 3,4,5	1.852±0.55	1.725±0.49	0.368
CKD Stage,4,5	1.875±0.63	1.776±0.48	0.368
TA ($T_{0,}T_{,1}$Vs $T_{2,}T_{3)}$	1.8063±0.53	1.8056±.52	0.995
IF grades(i_1+$i_{2)}$Vs i_3	1.805±0.53	1.807±0.54	0.938

The female gender and right kidney size were associated with Mean SWV in the study population as represented in the Univariate analysis for demographic features with ARFI measured Shear Wave Velocity.

Table 11 b. Univariate analysis of correlations with Mean SWV

Charactersitic	Pearson Correlation	p
Age (yrs)	**-0.09**	**0.364**
eGFR(ml/min/1.73 m^2)	**-0.02**	**0.810**
BMI	**0.15**	**0.133**
Haemoglobin(gm/dl)	**-0.06**	**0.529**
24 hour urine protein(mg/day)	**0.16**	**0.113**
S. Albumin(gm/dl)	**-0.10**	**0.308**
Rt Kidney Size (cm)	**0.29**	**0.002**
Lt Kidney Size (cm)	**0.18**	**0.064**
Echogencity	**0.05**	**0.640**
SBP (mm of Hg)	**-0.08**	**0.396**
DBP (mm of Hg)	**-0.02**	**0.847**
% glomerulosclerosis	**-0.11**	**0.272**

Means SWV in the chronic Kidney disease stages were overlapping in the CKD stages as represented below

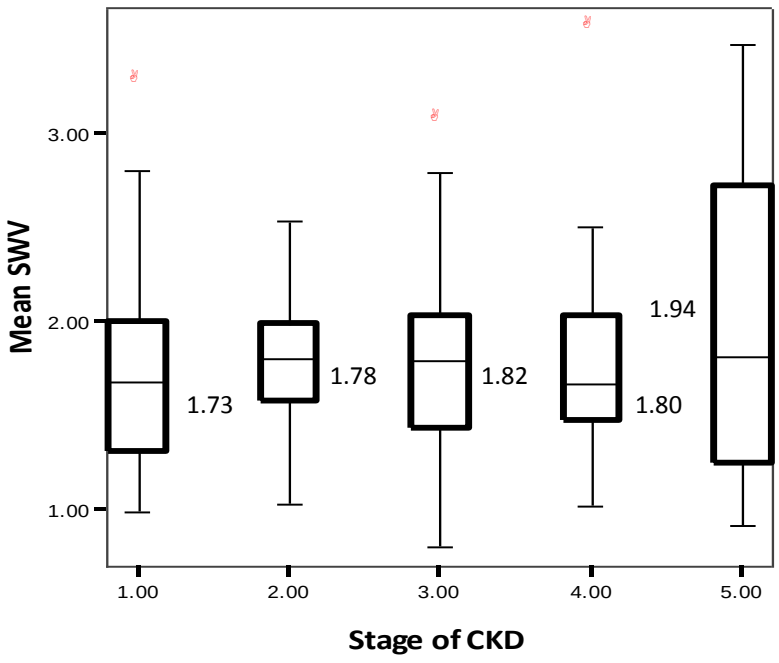

Figure 21.Box and whisker plot of mean SWV in CKD stages

Correlation of ARFI with the demographic data:

There was no correlation between the mean SWV measured by the ARFI in the lower pole of the native kidneys with demographic data variables like age, weight, BMI as well as with eGFR (R^2=0.002)

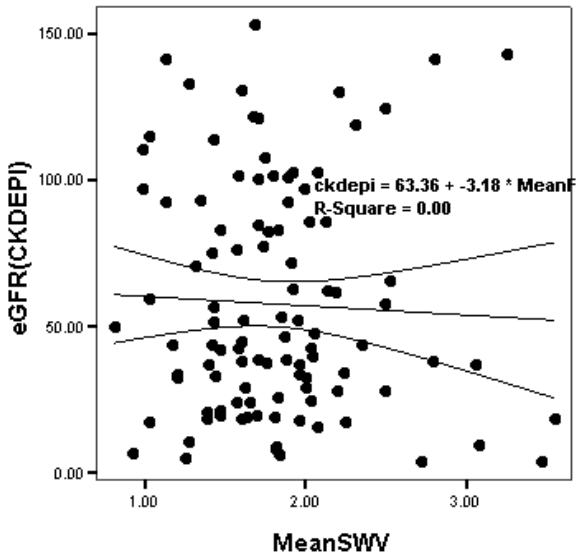

Figure 22. Correlation of eGFR (CKD EPI) with the MEAN SWV

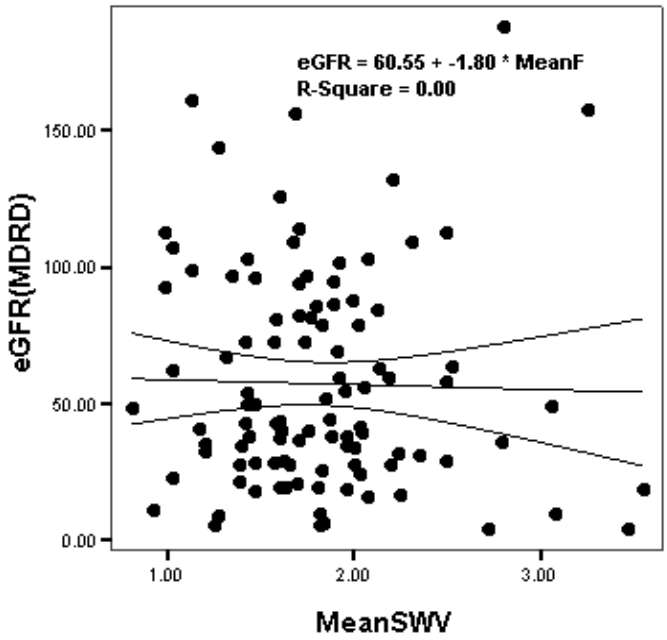

Figure 23. Correlation of eGFR (MDRD) with the MEAN SWV

ARFI WITH INTERSTITIAL FIBROSIS

The mean SWV values for IF were grouped in to three groups of <25%, 25-50% and >50% are represented in the following table

Table 12. Showing mean ARFI SWVs in the IF groups

Fibrosis scoring groups with respective mean SWV(m/sec)		
Groups	**Mean±SD**	**N**
<25%	1.92±0.55	18
25-50%	1.75±0.51	39
>50%	1.80±0.54	47
Total	1.80±0.53	104

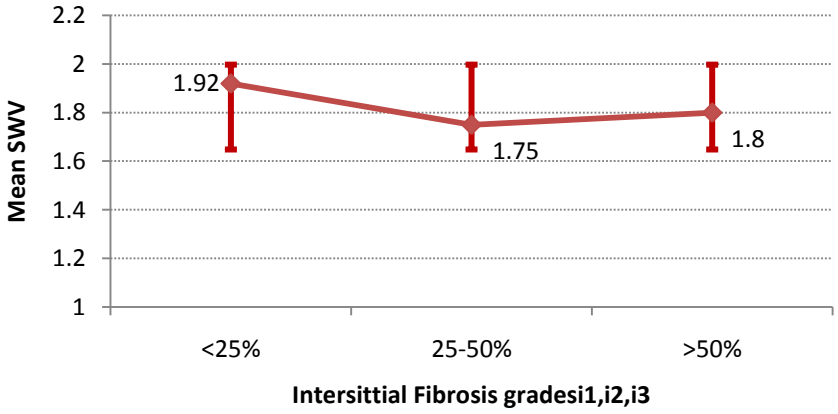

Figure 24. The mean SWV in the three IF groups

No obvious relation was seen between Mean SWV or Median SWV and IF (R^2=0.02).

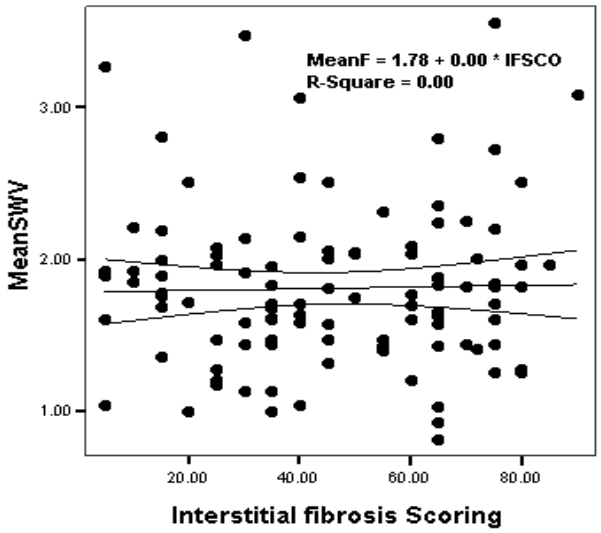

Figure 25.Scatter plot represent the correlation between the SWV and IF

There was a considerable overlap of SWV values and the fibrosis scores (R^2 was 0.00).No pattern of relation between the Mean SWV tubular atrophy grouped in to t0<25, t1>25-50%, t2>50-75%, t3>75% was observed and a similar trend noticed with the median SWV. There was a significant overlap without any distinction between the groups

Table 13. Mean ARFI SWV values in the tubular atrophy groups

Group	Mean±SD	N
T_0 (<25%)	1.80±0.52	27
T_1, (25-50%)	1.82±0.53	32
T_2, (50-75%)	1.76±0.51	39
T_3, (>75%)	1.98±0.71	6
Total	1.80±0.53	104

The box whisker plot representing the mean ARFI SWV values are depicted in the tubular atrophy groups demonstrating significant overlap of the ARFI score in different tubular atrophy groups.

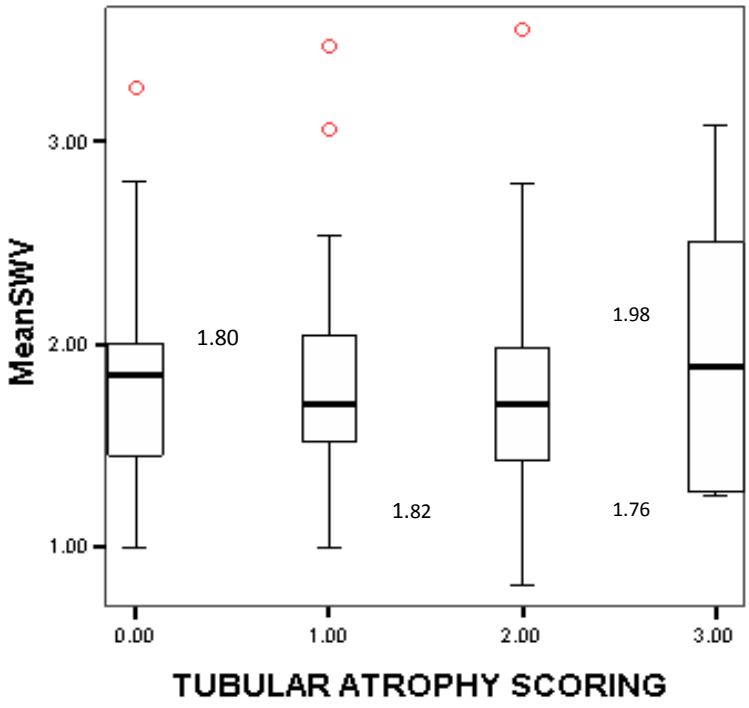

Figure 26.Box whisker plot of mean ARFI SWV values the tubular atrophy groups

In view of poor correlation with the ARFI values and the IF and tubular atrophy scores the groups were realigned in to mild and moderate fibrosis grouped together against the severe fibrosis to look for any correlation with SWV and its predictability to distinguish the groups. The correlation was done with independent t test for the realigned groups' $i_1$and i_2 together as a single group and i_3 in the other.

There was no correlation and the mean ARFI measured SWV in these group were not significantly different.

Table 14.Independent t test for mean and median SWV with realigned IF groups

IF groups	Mean SVW Mean±SD	Median SWV Mean±SD	P value
i_1+ i_2	1.69±0.68	1.64±0.80	0.43
i_3	1.82±0.51	1.76±0.55	0.49

The mean ARFI measured SWV in the realigned group were 1.69±0.68 and 1.80±0.53 but these were not statistically significant in differentiating the two groups from each other and the median SWV was also looked at for any correlation and for any significant difference between the two group with the paired t test. This analysis was also showed that median SWV value does not represent a distinguishing factor between the moderate fibrosis from severe fibrosis.

The independent t test was performed to look for mean SWV as factor for differentiating the early fibrosis from the advance fibrosis showed a p value of 0.49 for the median SWV and a p value of 0.43 for the mean SWV.

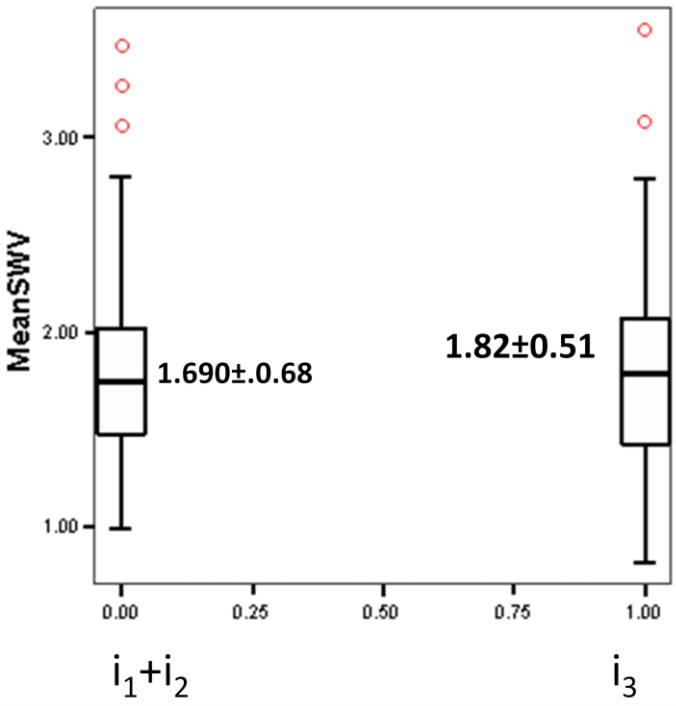

Figure 27. Box whisker plot of Mean SWV values IF groups

MEAN ARFI WITH CKD STAGING

As there was correlation between the Mean ARFI SWV and the IF we looked at comparison of the mean and median SWV in participants with different CKD stages using One Way ANOVA which also showed that there was no significance and SWV was also was not able to distinguish between CKD stags. Comparison of the Mean and Median SWV between the realigned groups based on CKD staging with stage1 and 2 realigned as group 1 and the stage 3, 4, and 5 as group two using independent sample t test. There was a overlap in the values of SWV for in these groups and the test was not able to distinguish between the early CKD and the late CKD

Table 15. One way ANOVA for Mean and Median SWV in CKD staging

MEAN SWV in different CKD stages		
Stage	Mean±SD	p value
1	1.73±0.59	0.887
2	1.78±0.35	
3	1.79±0.48	
4	1.82±0.51	
5	1.94±0.86	
Median SWV		
Stage	**Mean±SD**	**p value**
1	1.67±0.64	0.923
2	1.73±0.39	
3	1.73±0.51	
4	1.83±0.53	
5	1.77±0.97	

Table16. Independent t test with Mean SWV in Realigned CKD Groups

SWV	Realigned Group	Mean±SD	Sig. (2-tailed)
Median SWV	CKD stage 1+2	1.67±0.54	0.29
	CKD stage 3-5	1.79±0.60	
Mean SWV	CKD stage 1+2	1.73±0.49	0.28
	CKD stage 3-5	1.84±0.55	

The distribution if the mean SWV in the two groups has been represented in the box plot as below.

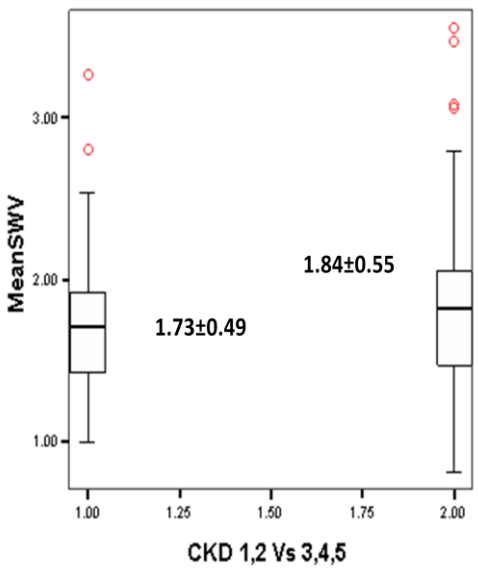

Figure28 .Box Plot depicting Mean SWV in realigned CKD groups.

To assess the consistency of the values of the mean SWV a correlation of for all five values measured in each kidney were assessed.

Table 17.Shear wave velocity (SWV) Correlation between in same kidney in same patient

Similarity matrix

Right side	**Rt. SWV 1**	**Rt. SWV2**	**Rt. SWV 3**	**Rt. SWV 4**	**Rt. SWV 5**
Rt.SWV 1	1.000	0.529	0.421	0.554	0.464
Rt.SWV 2	0.529	1.000	0.375	0.529	0.453
Rt.SWV 3	0.421	0.375	1.000	0.609	0.555
Rt.SWV 4	0.554	0.529	0.609	1.000	0.688
Rt.SWV 5	0.464	0.453	0.555	0.688	1.000
Left side	**Lt.SWV 1**	**Lt.SWV 2**	**Lt.SWV 3**	**Lt.SWV 4**	**Lt.SWV 5**
Lt.SWV 1	1.000	0.415	0.566	0.330	0.490
Lt.SWV 2	0.415	1.000	0.459	0.603	0.420
Lt.SWV 3	0.566	0.459	1.000	0.446	0.385
Lt.SWV 4	0.330	0.603	0.446	1.000	0.449
Lt.SWV5	0.490	0.420	0.385	0.449	1.000

The correlation index between the mean SWV velocity of the right and left kidney correlations was only 0.561 and there was a wide variability in the measurement between SWV in same kidney and between two kidney in the same individual.

Clinical and Radiological predictors of IF:

The clinical parameters were looked for correlation with the interstitial fibrosis scoring as a continuous variable.

Univariate analysis has shown that hypertension at presentation and the renal dysfunction as defined by the CKD staging was showing a significant association with the interstitial fibrosis. The tubular atrophy was also significantly associated with a p value of <0.000.

Table 18.Clinical predictors of interstitial fibrosis

characteristics	Fibrosis % score (Mean ±SD)		P value
	YES	NO	
Sex(F)	43.64±26.42	46.67±21.68	0.553
Smoking	43.57±18.41	46.02±23.32	0.787
Hypertension	***51.05±21.92***	***32.42±20.24***	***0.000***
Diabetes	48.72±23.67	45.25±22.90	0.563
Hematuria	48.02±22.97	44.60±23.03	0.467
Edema	44.26±24.11	48.51±20.90	0.363
CKD Stage 3,4,5	***56.50±19.82***	***27.36±14.90***	***0.000***
CKD Stage,4,5	***65.32±14.94***	***37.58±20.70***	***0.000***
TA (T_1,T_2,T_3)	***51.05±21.92***	***32.41±20.22***	***0.000***

The clinical predictors which were continuous variables were looked for strength of correlation with Pearson's correlation. This showed a significant correlation of eGFR, BMI, Haemoglobin, albumin, echogenicity, systolic blood pressure at presentation and percentage of glomerulosclerosis with interstitial Fibrosis

Table 19.Correlation of Continuous variables with IF scoring

Characteristic	Pearson Correlation	Sig. (2-tailed)
Age(yrs)	0.171	0.082
eGFR(ml/min/1.73m^2)	***-0.711***	***0.000***
BMI	***0.221***	***0.024***
Haemoglobin(mg/dl)	***-0.499***	***0.000***
24 hour urine protein(mg/day)	-.117	0.239
Albumin(gm/dl)	***0.330***	***0.001***
Size of Rt kidney(Cm)	-0.171	0.083
Size of Lt kidney (Cm)	-0.149	0.132
Echogenicity	***0.335***	***0.000***
Systolic BP (mm of hg)	***0.323***	***0.001***
Diastolic BP (mm of hg)	0.203	0.039
% Glomerulosclerosis	***0.516***	***0.000***

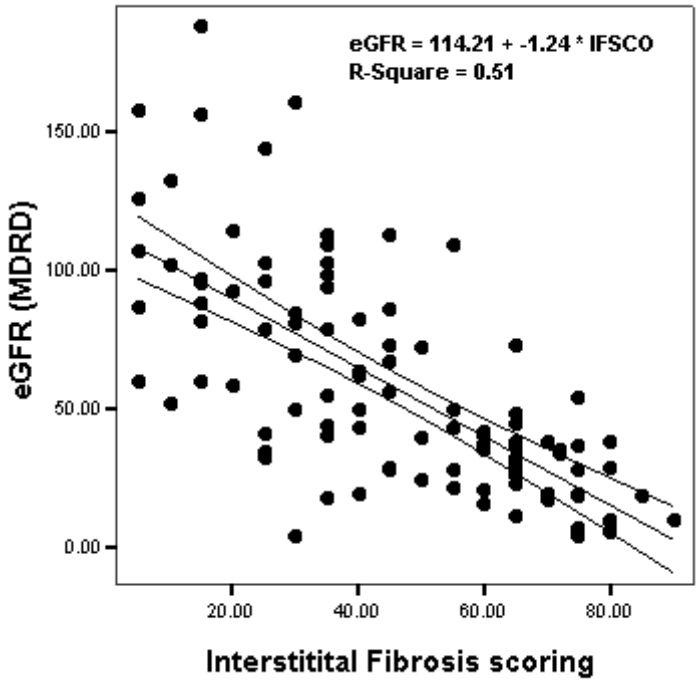

Figure 29.Scatter plot between the eGFR (MDRD) and IF showing a negative correlation

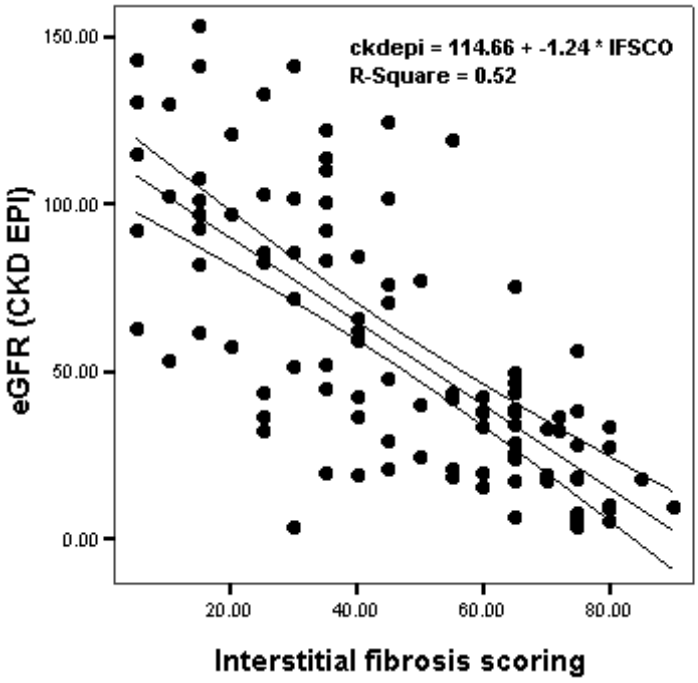

Figure 30.Scatter plot between the eGFR (CKDEPI) and IF showing a negative correlation

The above scatter plots represent a good negative correlation with interstitial fibrosis ad the R^2=0.52

Table20. Linear regression model for interstitial fibrosis

Variables	B	Sig.	95% Confidence Interval	
			Lower bound	Upper bound
eGFR (ml/min/1.73 m^2)	***-.414***	***0.000***	***-.510***	***-.317***
Haemoglobin(mg/dl)	1.842	0.027	-3.467	-.217
24hr urine protein(gm/day)	0.001	0.049	.000	.000
Age(yrs)	-.188	0.98	-.412	.035

Dependent variable Interstitial fibrosis

To look for the independent predictability a linear regression analysis for interstitial fibrosis was done with the clinical and radiological predictors. Using this model eGFR and haemoglobin and 24 hr urine protein were found to be significant independent predictors. The cumulative predictive power of the model was 76%.The variable entered at the begin of the linear regression model done by the backward method were e GFR, Haemoglobin,24 hr urine protein, systolic blood pressure at presentation, age, BMI, albumin and echogenicity of the kidneys

Clinical and Radiological predictors for grades of IF

We analysed the clinical predictors for the interstitial fibrosis grades with Univariate analysis Showed that hypertension pressure at presentation, Haemoglobin was showing a significant association. Radiological echogenicity of the kidney on ultrasound was also associated with a p value of 0.005.Histological markers of tubular atrophy was showing a p value of <0.0001

Table 21. Univariate analysis for clinical predictors of interstitial fibrosis grades

Clinical predictors	Fibrosis Grade (I_1+I_2) n(%) or Mean ±SD N=57	Fibrosis Grade (I_3) n(%) or Mean ±SD N=47	P value
Age (years)	38.1±14.9	39.0±13.5	0.758
Sex(F)	17(29.8)	11(23.4)	0.463
BMI	23.06±4.4	24.7±4.03	0.444
Smoking,n(%)	6 (10.5)	1(2.1)	0.125
Diabetes n(%)	10 (17.5)	8(17)	1.000
Edema n(%)	37(64.9)	28 (59.6)	0.685
Hematuria n(%)	18 (35.1)	20 (38.3)	0.833
SBP(mm of Hg)	***127.71±1.09***	***133.65±12.20***	***0.010***
DBP (mm of Hg)	82.89±5.47	84.61±7.14	0.167
Haemoglobin(gm/dl)	***12.04±1.95***	***10.7±2.1***	***0.001***
24 hr Ur. Protein(mg/day)	3351.78±3.477.57	3160±3650.74	0.785
Sr. Albumin(gm/dl)	***3.81±1.1***	***3.5±0.8***	***0.078***
US size Rt(cm)	10.13±1.1	9.81±1.17	0.133
US size Lt (cm)	10.35±1.10	10.07±1.36	0.250
Echogenicity(grade)	***0.96±0.86***	***1.44±0.85***	***0.005***
Tubular Atrophy	***30(52.6)***	***25(95.7)***	***<0.0001***
%glomerulosclerosis	14.68±22.7	40.25±3.71	0.167
CKD Stage 3,4,5	***23(40.4)***	***43(91.5)***	***<0.0001***
CKD Stage 4,5	***6(10.5)***	***25(53.2)***	***<0.0001***

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Table 22.Multiple Logistic Regression Model For Clinical And Radiological Predictors Of Interstitial Fibrosis

Characteristics	Sig.	Exp(B)	Confidence interval	
			Lower bound	**Upper bound**
Smoking	0.019	0.044	.003	.593
Systolic BP(mm of Hg)	0.243	1.028	.981	1.077
Haemoglobin(gm/dl)	0.036	0.736	.592	.982
urineprotin24hr(mg/day)	0.278	1.000	1.000	1.000
Sr. Albumin (gm/dl)	0.454	1.293	.660	2.530
Echogenicity	0.564	1.208	.635	2.301
CKD Stage4,5	0.004	6.788	1.853	24.860
Enter method Variable entered at step one Smoking Systolic Blood pressure at presentation 24 hr urine protein serum albumin, kidney echogenicity, CKD stage 4+5, and haemoglobin				

The interstitial fibrosis scoring was realigned into 2 groups with the first group representing i_0 and i_1 and the second group consisting of the i_3 and a binary regression model for the predicting the interstitial fibrosis grades was created . And using this model, different clinical and radiological variable was analysed and it was shown that eGFR by the CKD Stage 4and 5, smoking, Hemoglobin were the independent predictor of grades of interstitial fibrosis and are helpful in distinguishing the early fibrosis from the advanced fibrosis $_{with}$ p value of <0.05. The following scatter plot represents the correlation of interstitial fibrosis scoring and other variable in the study population

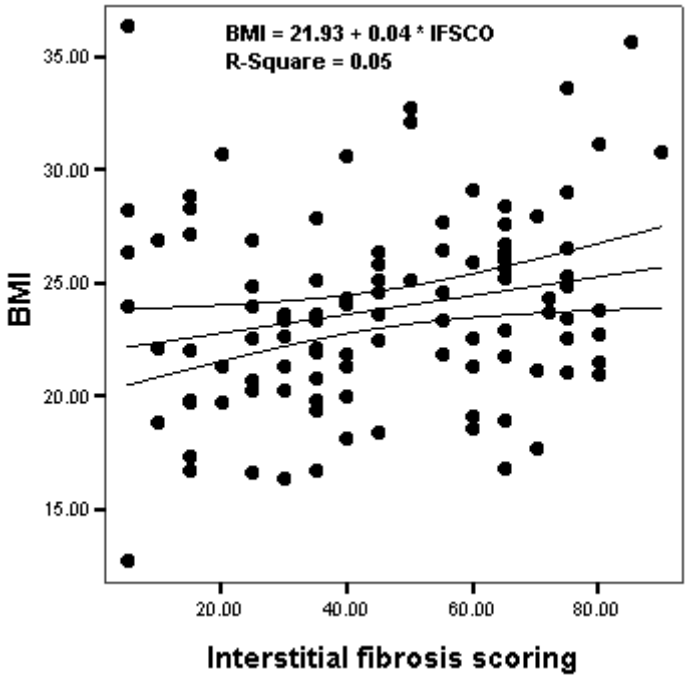

Figure 31. Correlation of BMI with IF scoring

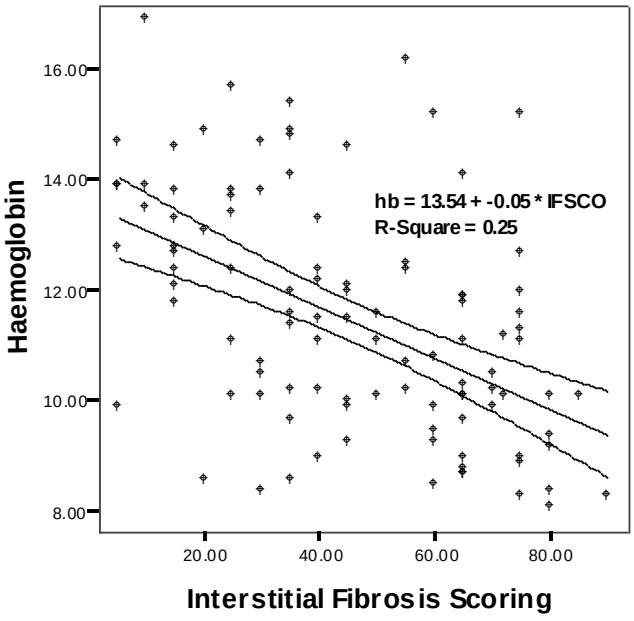

Figure 32. Correlation of Haemoglobin with IF scoring

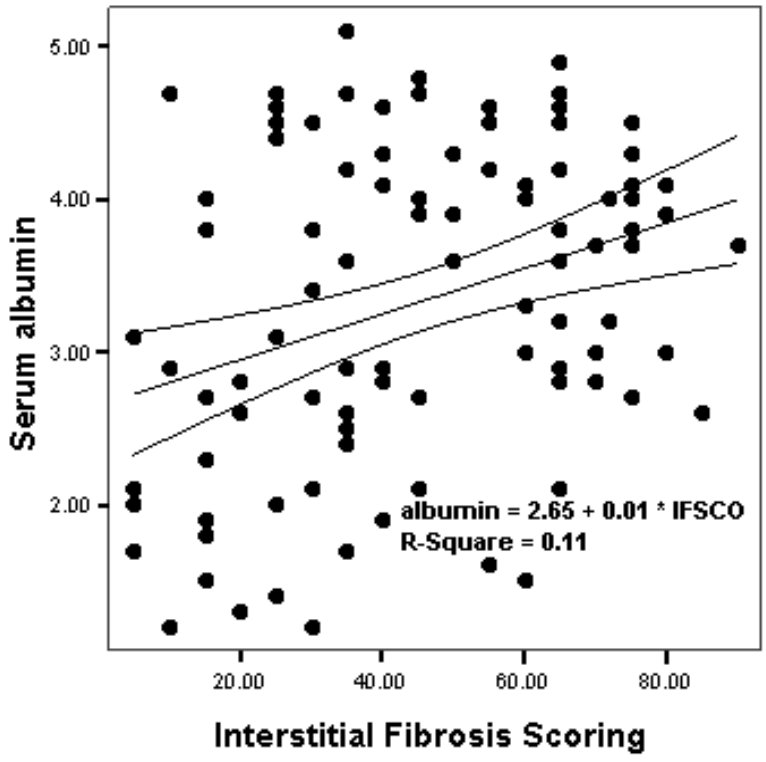

Figure 33. Correlation of serum albumin with IF scoring

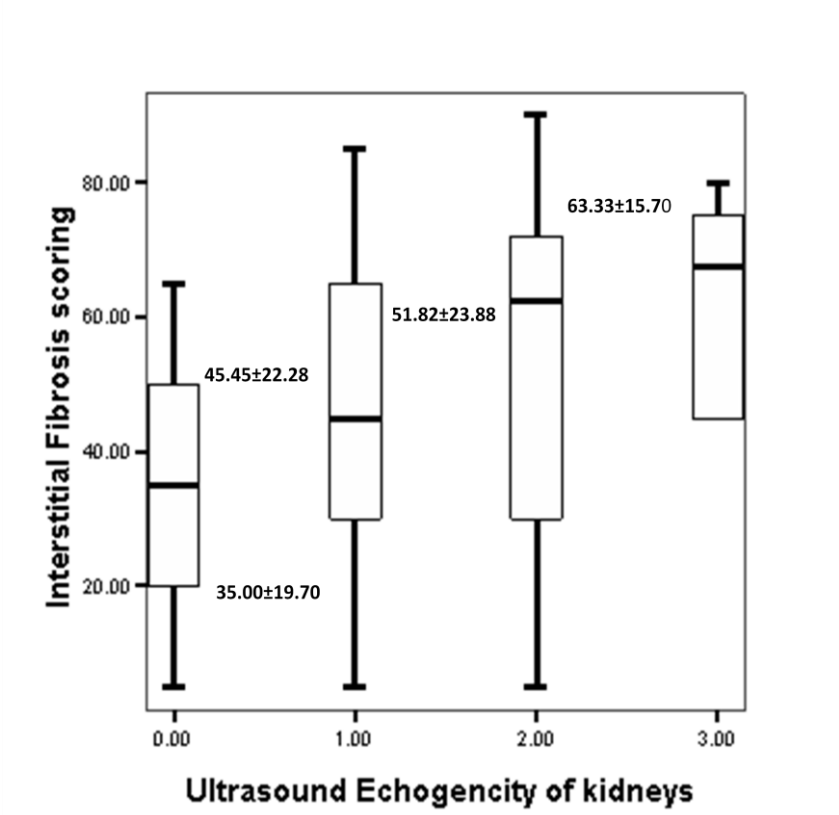

Figure 34. Box whisker plot for the grades of the echogenicity with Mean SWV

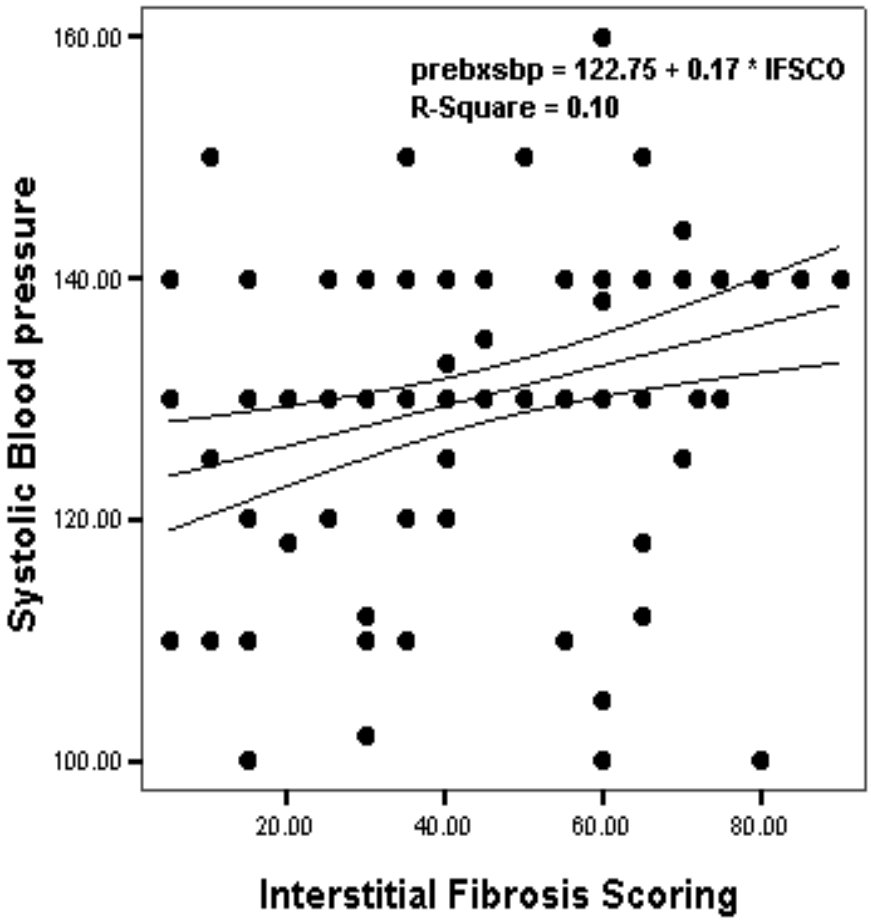

Figure 35. Correlation of systolic blood pressure with IF scoring

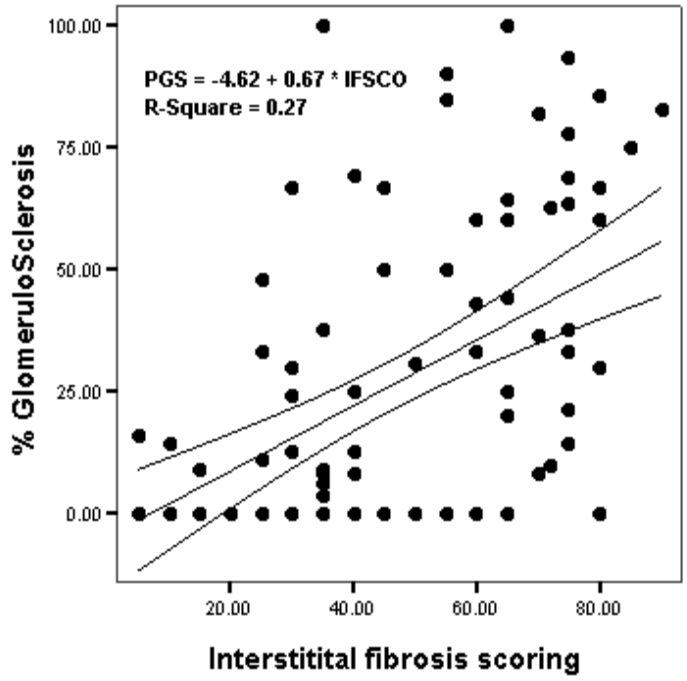

Figure 36. Correlation of percentage glomerulosclerosis with IF scoring

Discussion

An important step in effective management of CKD is to diagnose the chronic kidney disease at an early stage. The gold standard to know the extent of the fibrosis in renal tissue is biopsy with several validated methods for assessment. Interstitial fibrosis on the renal biopsy has been shown to be the best prognostic indicator for the decline in renal function in many numbers of studies

Renal biopsy is invasive and associated with potentially serious and sometimes even life threatening adverse effects. The current focus of the health care industry towards more and more non invasive methods for diagnosis and therapy we looked at ways for assessing the renal interstitial fibrosis non-invasively.

ARFI has been well established in the field of hepatology where it has become a routine tool for non invasive assessment of the fibrosis in the liver. The important attribute to the AFRI is that it measures the tissue elasticity quantitatively. There has been very limited literature about the use of this modality in assessment of interstitial fibrosis. A practical application of the ARFI in the assessment of renal allograft fibrosis and in native kidney was evaluated in the recent studies with mixed results [107,108].

In our study we have evaluated the utility of the ARFI generated mean SWV velocity in the predicting the renal interstitial fibrosis in native kidneys. The lack of abundant data regarding the utilisation of the ARFI in native kidneys is indicated by the absence of a population based mean SWV.

Baseline Characteristics of the study population

The demographic characteristics of the study cohort were representative of the population that seeks nephrology consultation. The baseline characteristics were comparable to the population in general with kidney disease indicating the applicability of the study results.The

kidney sizes were in the normal range in all five stages of CKD. This could be because these are patients who were advised for a renal biopsy by the treating physician and a biopsy is unlikely to be advised if the kidneys are of small size.

The predominant pre-biopsy syndrome diagnosis was nephritis. The final diagnosis was predominantly an IgA nephropathy and other primary glomerulonephritis in whom the interstitial fibrosis is more closely associated with the worsening renal function. The mean interstitial fibrosis in the study population was 45.85±22.9% with 85% in the i1 and i_2 groups. As expected, a similar distribution was seen with tubular atrophy scores.

ARFI measured SWV in relation to IF and CKD Staging

The ARFI was done prior to the biopsy and the SWV velocity has a normal distribution in the study population. There was a considerable variability in the values obtained both within the same kidney and between the two kidneys in the same individual. There was no correlation of ARFI measured SWV with the age, BMI or eGFR. There was no correlation with interstitial fibrosis scoring and even after the realignment of fibrosis scores to compare the ability to predict the moderate fibrosis from severe fibrosis the mean SWV failed to show any distinction and similar results was also seen with the Median SWV. The significant variability in the SWV values within the kidney and between the kidneys in the same individual, show that the assessment is not consistent despite standard procedure followed for the kidneys. The considerable overlap in the SWV in relation to both the degree of interstitial fibrosis and the CKD staging shows that test has a poor ability in distinguishing the renal fibrosis.

The study from the Guo L-H et.al [109] has shown a good correlation with the age in 327 healthy individuals and there was a higher SWV in the general population than the CKD patients. There was a significant difference in males and females in the healthy subjects as

well as the CKD patients. In contrast to our study it was only correlating with gender but not with age. The Guo L-H et.al said that in their study the Mean SWV was not correlated with the Wt, BMI, and size of the kidney and the depth of SWV measurement in a small subgroup of their study population. The mean SWV was value of the CKD patient was 1.69±0.42 m/sec in comparison with the normal population 2.15±0.51 m/sec and in CKD and they proposed a cut off value of 1.88 m/sec with 71.87% sensitivity and 69.69%, specificity for identifying CKD . There study also showed that there was a significant overlap in the SWV in the various stages of CKD and was not able to differentiate the stages of CKD and there was no correlation with the any laboratory parameter in the chronic kidney disease except the eGFR and its determinants creatinine and the urea. For the assessment of interstitial fibrosis a study from Guanghe Cui et al 110 showed that in 76 patient of chronic kidney disease showed a difference of Shear wave velocity in the mild group to the moderate group with a mean value of 1.67 m/sec. The significance of IF in the moderate to the late fibrosis in predicting the benefit of therapeutic intervention and it would be best to have a marker which can predict between the moderate to sever fibrosis and with that regard the SWV by the ARFI was not useful.

We are looking for a marker for predicting early fibrosis from late fibrosis and it is futile to try look for differentiating CKD from the general population with a test that has a sensitivity of around 70% .We have more cost effective investigations for diagnosing CKD. The need of the hour is for a predictor which will differentiate between the fibrosis occurring in the different stages of CKD and help us plan therapeutic intervention accordingly.

With reference to this aim the ARFI measured SWV in our study were not correlating with CKD staging. And when we looked for the predictability of this test in prediction of early Vs late CKD it was not able to distinguish and there was a considerable overlap.

This could be because of unique architecture of kidney with predominantly fluid filled compartment which would negate the ability of ARFI to diagnose fibrosis. Also the amount of fibrosis that occurs in the kidney to cause clinical implication may be relatively less compared to the liver where this technique has been helpful in diagnosing fibrosis. The current method of ARFI is not standardised for individual organs and this might played a role in the negative correlation in our study. Though this test is considered to be quantitative assessment there are several factors which will influence SWV measurement. The important factors to be considered include the operator's choice of the area of interest, the ability to hold the breath by the patient and to focus the ROI box exactly over the lower pole, the depth of the kidney which markedly varies in individuals, and the experience of the operator in measurement and consideration of possible outlier measures. This proves that there is a significant scope for subjective errors in this methodology and effort to standardize and probably a more organ specific and sensitive measurement taking in to account physical characters of individual organs is required to improve this percutaneous technique.

Size of the kidneys was not correlating in our study, but the echogenicity of kidney assessed at the time of diagnostic Ultrasound was correlating the degree of interstitial fibrosis. This reflected the change in the physical attributes of the kidney tissue with increased tissue causing acoustic impedance. As this is reported with US machine, standardized objective assessment of echogenicity for me further evaluated which would lead to more effective utilization of a conventional instrument that ARFI based SWV measurement.

Clinical Predictors of interstitial Fibrosis

The clinical predictors of interstitial fibrosis the eGFR had a good negative correlation with the interstitial fibrosis. The hypertension and more specifically the systolic blood pressure at the presentation of >130 mm of Hg at presentation and eGFR and stage of CKD, haemoglobin, interestingly the echogenicity of kidneys were associated with interstitial

fibrosis on univariate analysis. The other association were the tubular atrophy and the percentage glomerulosclerosis. On linear regression analysis with interstitial fibrosis as a continuous and dependent variable has shown that eGFR, haemoglobin, 24 hr urine protein were independent predictors of interstitial fibrosis.

When these predictors were looked at predictive ability to differentiate early fibrosis from late fibrosis was the systolic blood pressure of >130 mm of Hg, haemoglobin and echogenicity along with stage of CKD were showing a significant correlation with the grading of the interstitial fibrosis in to moderate and severe grades. Advanced CKD stage (4&5), haemoglobin at presentation and anaemia were independent predictors helpful in differentiating the moderate from severe fibrosis.

It was interesting to know that the echogenicity was an independent predictor of the degree of fibrosis measured by the radiologist and it may due to the different physical attributes of the fibrotic renal tissue which are measure by the ultrasound waves. The echogenicity detects the ability to reflect the waves which increase as the solid component of the tissue increases , where as the ARFI looks for displacement of the tissue for generation of shear wave and the amount of fibrosis in the kidney may not be sufficient enough to produce a shear wave sufficient enough to be accurately distinguish the various grades of interstitial fibrosis with clinical implications and also the fact that the fluid content of the kidney may be related to hydration the might likely interfere with the SWV measurement. These require further studies to establish this modality in the field of Nephrology.

Finally the important correlation with the interstitial fibrosis clinical predictors like eGFR, haemoglobin, systolic blood pressure at the time of presentation, echogenicity of kidney on ultrasound and the histological predictors like tubular atrophy and glomerulosclerosis with interstitial fibrosis proves the role of control of anaemia and the blood pressure to <130 mm

of Hg in retarding the progression of interstitial fibrosis. The CKD staging for management of renal disease also reiterated the fact that the e GFR is was an independent predictor for the IF. The important message that the IF well correlated with by the grades of Tubular atrophy and the glomerulosclerosis emphasizes the fact that the renal histology is the best modality to assess the IF and its severity and hence remains the gold standard for assessing the IF.

Conclusions

1. There was no correlation between the non-invasive Acoustic Radiation Force Impulse imaging (ARFI) measured mean & median Shear Wave Velocity SWV in the lower pole and the interstitial fibrosis in renal biopsy specimens from the lower pole biopsy.
2. The Modified Diet Renal Disease estimated Glomerular Filtration Rate (eGFR), Hypertension and specifically the systolic blood pressure, and haemoglobin at presentation were significant clinical predictors of interstitial fibrosis(IF)
3. Semi-quantitative assessment of renal cortical echogenicity by ultrasound significantly correlated with degree of renal interstitial fibrosis. This prediction was much superior to that by Acoustic Radiation Force Impulse imaging measured Shear Wave Velocity (SWV)
4. The histological markers of tubular atrophy and the glomerulosclerosis had a good correlation with interstitial fibrosis(IF)
5. Along with clinical features of estimated Glomerular Filtration Rate (eGFR), and hypertension, the renal biopsy with semiquantitative assessment of renal fibrosis remains the gold standard for assessment of interstitial fibrosis until further sensitive and valid methods of non-invasive assessment of interstitial fibrosis are available.

ANNEXURES

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Sno	Name	Hospno	ckdepi	Crea	AGE	RDF	eGFR	Stage	Sex	Ht
61.00	RAJENDRATHAI	616664F	96.70	0.93	48.00	0	92.17	1.00	1	173
94.00	SONI KHTOON	681110F	97.00	0.83	27.00	0	87.60	2.00	0	144
101.00	ANKITTIGGA	783118F	101.00	0.86	15.00	0	94.80	1.00	1	169
49.00	CHITTEM LAKSI	602126F	130.30	0.66	17.00	0	125.42	1.00	0	165
24.00	SHILA DEVI	656789F	107.50	0.74	32.00	0	96.67	1.00	0	155
70.00	SONAM KUMAR	693258F	129.80	0.81	18.00	0	131.90	1.00	0	154
81.00	GOPAL KRISHN	715125F	92.70	0.85	63.00	0	96.76	1.00	1	161
90.00	KRISHNA UPDH	775526F	57.60	1.34	59.00	1	58.19	3.00	1	153
14.00	BIDYUT KARMA	661381F	114.60	0.94	22.00	0	106.66	1.00	0	162
12.00	DEEPAK KUMAI	666235F	62.50	1.49	29.00	1	59.26	3.00	1	181
18.00	SUMAN KUMAR	183328F	52.90	1.54	47.00	1	51.44	3.00	1	166
63.00	DEBASHISH GH	685301F	153.10	0.56	16.00	0	156.00	1.00	1	147
50.00	SUMIT KUMAR	641459F	141.30	0.67	17.00	0	188.00	1.00	1	157
8.00	DOLY MUKHER	654293F	61.60	1.02	56.00	1	59.58	3.00	0	152
26.00	ANIL KUMAR SI	663874F	82.00	1.00	59.00	0	81.29	2.00	1	165
103.00	JAYASHREEDA	778270F	142.80	0.51	16.00	0	157.45	1.00	0	146
88.00	PARASURAM P#	199122D	92.20	1.02	39.00	0	86.42	2.00	1	163
9.00	INDRANI	657784F	102.40	0.65	52.00	0	101.73	1.00	0	151
#NULL!	JOHN EMMANU	685193F	121.00	0.92	18.00	0	113.89	1.00	1	163
35.00	MANDESHWA I	681495F	113.50	0.75	22.00	0	102.70	1.00	0	161
69.00	NARBAHADUR T	682106F	43.40	1.88	41.00	1	40.98	3.00	1	165
97.00	PRODIPKUMAR	843699C	32.30	2.33	46.00	1	32.21	3.00	1	166
4.00	PRADEEP	653593F	70.70	1.33	31.00	0	67.10	2.00	1	171
39.00	SANGITA MISHI	635680F	29.20	2.15	34.00	1	27.89	4.00	0	147
83.00	KRISHNA DHAR	642845F	110.20	0.80	42.00	0	112.67	1.00	1	168
33.00	IYYA KANNU	648827F	92.10	0.88	62.00	0	98.40	1.00	1	170
38.00	NIRMAL MONDA	682551F	141.30	0.67	17.00	0	160.58	1.00	1	165
68.00	VIJAYA	639844F	62.00	1.28	16.00	0	62.95	2.00	0	157
42.00	CHOKEY	847781C	77.40	0.89	47.00	0	72.26	2.00	0	162
78.00	SAROJ KUMAR	692208F	36.60	1.95	59.00	1	34.15	3.00	1	163
41.00	NARAYAN CH S	655008F	42.70	1.77	55.00	1	42.66	3.00	1	162
51.00	KRISHNAMURTI	496628F	101.40	0.91	45.00	0	80.62	2.00	1	155
46.00	HUSNA PARVEE	673037F	121.70	0.70	24.00	0	109.30	1.00	0	160
89.00	MUKESH PRAS/	497365D	71.60	1.20	47.00	0	68.98	2.00	1	171
6.00	GOMATHI.V$	656931F	124.30	0.70	21.00	0	112.30	1.00	0	147

20.00	RANJEET SHAH	669540F	18.90	3.89	34.00	1	18.96	4.00	1	167
93.00	KANNAN K.#	722932B	82.60	1.13	37.00	0	95.66	1.00	1	160
25.00	APURBA SAMAI	669826F	59.30	1.37	51.00	0	61.86	2.00	1	166
17.00	SANJAY DAS	656402F	19.60	3.95	26.00	1	17.72	4.00	1	170
65.00	NIRMAL MAITY#	679986F	82.90	1.12	38.00	0	78.41	2.00	1	157
67.00	SUDIP DUTTA	684925F	21.00	2.50	53.00	1	28.10	4.00	0	160
36.00	HEMALATHA$	684214F	85.40	0.96	20.00	0	78.80	2.00	1	164
80.00	SAILESH TIWAF	748221F	47.70	1.78	37.00	1	55.97	3.00	1	166
84.00	GOURCHANDRA	746819F	85.70	0.97	58.00	0	84.49	2.00	1	163
48.00	TABASSUM BEA	677928F	132.80	0.56	22.00	0	143.88	1.00	0	152
60.00	BHARATH PRAI	654023D	51.50	1.64	40.00	1	49.70	3.00	1	162
2.00	SANJIB SAMAN	453957D	76.20	1.18	41.00	0	72.30	2.00	1	164
85.00	KAILASH MODI	629902F	51.80	1.38	69.00	1	54.46	3.00	1	162
13.00	MOHAMMED SH	643613F	51.80	1.70	33.00	1	39.72	3.00	1	157
55.00	PANKAJ KUMAF	682342F	24.30	3.14	35.00	1	24.14	4.00	1	171
91.00	VIDYASAGARBU	781384F	39.80	2.03	40.00	1	39.53	3.00	1	165
34.00	MAHMUDUL HA	009064F	100.30	1.05	22.00	0	93.87	1.00	1	170
52.00	ANIL PRASAD	439841F	84.50	1.01	53.00	0	82.13	2.00	1	168
31.00	SAM.M	348294F	101.40	0.84	51.00	0	85.70	2.00	1	157
16.00	BHAIRAB KARM	659178F	65.70	1.31	44.00	0	63.18	2.00	1	164
104.00	VISWANATH $	777133F	3.70	15.29	29.00	1	4.03	5.00	1	171
23.00	GAHNU MAHTO	600374F	44.80	1.83	41.00	1	43.58	3.00	1	165
57.00	SANYUKATHA#	678376F	36.60	1.56	57.00	1	49.22	3.00	0	154
40.00	SPANDAN GAYE	681651F	102.60	1.04	15.00	0	102.59	1.00	1	152
56.00	PRAVAT KUMAF	365659F	49.70	1.68	41.00	1	48.10	3.00	1	155
59.00	SUDHANSHU KU	677660F*	4.90	12.67	24.00	1	5.21	5.00	1	180
106.00	RAJUVERMA	780739F	5.10	11.91	28.00	1	5.36	5.00	1	165
43.00	NADA YATUNG	328179F	46.40	1.60	19.00	1	44.13	3.00	0	156
11.00	MANIKANDAN#	668870F	17.20	4.48	23.00	1	22.40	4.00	1	172
1.00	ISRAR KHAN	613376F	42.10	1.96	38.00	1	49.45	3.00	1	165
71.00	ARUN KUMAR$	675454F	33.20	2.36	40.00	1	37.78	3.00	1	176
96.00	SAROJAMMAL	627390F	27.70	1.93	60.00	1	28.67	4.00	1	150
47.00	SANKAR $	660215F	32.50	2.14	60.00	1	33.67	3.00	1	165
86.00	ASIT KUNDU	677279F	33.30	2.38	38.00	1	35.05	3.00	1	171
72.00	NITEN BARCAO	685743F	75.10	1.14	49.00	0	72.57	2.00	1	175
44.00	VANDANA SRIV	659814F	37.80	1.81	27.00	1	35.64	3.00	0	156

32.00	BITHIKA RAY	383618C	38.30	1.65	41.00	1	36.44	3.00	0	153
53.00	CHINMAY PATH	669710F	23.80	3.27	31.00	1	28.23	4.00	1	162
110.00	MOTIAR RAHAM	747973F	7.50	8.13	38.00	1	5.60	5.00	1	162
3.00	SHAMBHU SING	654398F	38.60	2.13	36.00	1	37.77	3.00	1	168
15.00	RAJAT CHOUDH	662950F	25.80	2.89	41.00	1	25.72	4.00	1	171
109.00	NARANASWAM'	720906F	8.70	6.38	60.00	1	9.55	5.00	1	168
92.00	ANUP KUMAR#	702771F	38.10	2.34	22.00	1	37.23	3.00	1	160
95.00	URMILA PANDE	773832F	3.60	11.18	47.00	1	3.90	5.00	0	146
19.00	ARABINDA BAN	645776F	6.80	8.26	51.00	1	10.80	5.00	1	166
102.00	MUKTADAS	779479F	118.90	0.95	15.00	0	109.05	1.00	1	148
66.00	TAPAN KUMAR	685135F	43.50	1.70	58.00	1	42.91	3.00	1	166
29.00	SUNIL KUMAR M	669331F	20.70	3.31	49.00	1	21.30	4.00	1	165
64.00	DILIPD KUMAR#	689804F	18.10	3.78	45.00	1	18.98	4.00	1	170
62.00	MOHAMMED SH	681662F	23.70	3.06	43.00	1	27.79	4.00	1	167
7.00	RENU DEVI	656761F	18.60	3.08	36.00	1	27.30	4.00	0	155
73.00	SINHA VK#	457192F	37.50	1.90	60.00	1	39.67	3.00	1	171
45.00	ANAMIKA ROY	668607F	34.10	1.85	38.00	1	31.83	3.00	0	150
28.00	BULBUL DAS	658957F	9.40	4.90	54.00	1	9.81	5.00	0	156
21.00	SHAMSHER ALI	656125F	28.90	2.50	50.00	1	29.08	4.00	1	163
99.00	HANUMAN PRA	782925F	10.30	5.65	56.00	1	9.00	5.00	1	169
5.00	SARKER MOHAI	656935F	43.50	1.76	52.00	1	31.33	3.00	1	163
82.00	SUBHASH VISW	745016F	15.40	4.54	37.00	1	15.59	4.00	1	160
100.00	GUDDU	772610F	27.80	2.98	25.00	1	27.45	4.00	1	168
27.00	DEVANAND G	672603F	56.40	1.65	26.00	1	53.86	3.00	1	172
10.00	ANKITA SHAW$	665897F	18.30	3.34	22.00	1	18.32	4.00	0	145
98.00	HARIHAR SINGH	924759C	32.70	2.10	62.00	1	37.68	3.00	1	163
107.00	AFSANAPARVEI	729385F	6.20	8.34	22.00	1	6.37	5.00	0	156
87.00	PRADEEP KUM/	780100F	19.40	3.56	46.00	1	20.55	4.00	1	165
30.00	KRISHNASAMY	673320F	17.90	3.74	49.00	1	18.42	4.00	1	176
54.00	SANJAY $	687526F	42.30	1.92	41.00	1	41.23	3.00	1	160
22.00	SRABONI SAMA	782971D	36.60	1.87	26.00	1	34.59	3.00	0	156
105.00	PRIYANKAMALL	779385F	17.00	3.45	30.00	1	16.57	4.00	0	165
58.00	DALJEET SINGH	682524F	19.00	3.68	43.00	1	19.27	4.00	1	168

Wt	BMI	Smoking	familydm	HTN	presentHtn	Others	Antihtn	Antiplatelet	Edema	renaldysfunction
63.60	21.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
56.28	27.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
47.66	16.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
34.58	12.70	0.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
47.64	19.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
44.52	18.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
74.72	28.80	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00
46.22	19.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00
69.10	26.30	0.00	1.00	1.00	1.00	0.00	0.00	0.00	1.00	0.00
92.38	28.20	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00
60.84	22.10	0.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
47.82	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
42.58	17.30	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
45.66	19.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
77.10	28.30	0.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
77.42	36.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
63.46	23.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
61.24	26.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
81.62	30.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
50.02	19.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
61.32	22.50	0.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00
74.26	26.90	0.00	0.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00
71.84	24.60	0.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00
54.30	25.10	0.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00
70.80	25.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
60.10	20.80	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
44.42	16.30	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
44.60	18.10	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	1.00
66.00	25.10	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
63.52	23.90	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
52.60	20.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
48.64	20.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
42.64	16.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
66.12	22.60	0.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
39.70	18.40	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00

59.30	21.30	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00
63.40	24.80	0.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00
66.96	24.30	0.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
63.20	21.90	1.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00	1.00
57.44	23.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
57.42	22.40	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00
54.40	20.20	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00	0.00
72.48	26.30	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00
61.96	23.30	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00
38.36	16.60	0.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00
61.90	23.60	0.00	0.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00
63.40	23.60	0.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
73.08	27.80	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
58.24	23.60	0.00	0.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00
95.72	32.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
87.50	32.10	0.00	0.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00
57.20	19.80	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
86.24	30.60	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00
63.50	25.80	0.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
64.54	24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
62.40	21.30	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00
60.20	22.10	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
51.60	21.80	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00
47.90	20.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
64.16	26.70	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00
80.30	24.80	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00
61.90	22.70	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00
45.90	18.90	0.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
77.86	26.30	0.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00	1.00
59.30	21.80	0.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00	1.00
64.76	20.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
70.00	31.10	0.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00
64.60	23.70	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00
55.96	19.10	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00
70.26	22.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
41.00	16.80	0.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	1.00

61.92	26.50	0.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	1.00
67.06	25.60	0.00	0.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00
59.14	22.50	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00
61.36	21.70	0.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00	1.00
82.96	28.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
60.60	21.50	0.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
54.56	21.30	0.00	0.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00
61.74	29.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
72.02	27.60	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00
53.84	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
64.22	23.30	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00
75.36	27.70	0.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00	1.00
73.02	25.30	0.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00
72.56	26.00	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00
63.46	26.40	0.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	1.00
65.82	22.50	0.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00
58.88	26.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
74.92	30.80	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00
67.06	25.20	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
67.84	23.80	0.00	0.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00
69.70	26.20	0.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00	1.00
47.28	18.50	0.00	0.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00
59.38	21.00	0.00	0.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00
69.18	23.40	0.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00	1.00
70.60	33.60	0.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	1.00
46.76	17.70	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00
64.39	26.50	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00
70.64	25.90	0.00	0.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00
110.26	35.60	1.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00	1.00
69.30	29.10	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00
59.08	24.30	0.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00	1.00
57.58	21.10	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00
78.82	27.90	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00

hematuria	RBC	comodm	comoHTN	ComoCAD	maligancy	priorkdsisease	VAR00004	prebxdiag	hb	platelet
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	MGN	8.50	145,000.00
0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	Mes PGN	13.20	262,000.00
1.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	MCD	11.70	242,000.00
1.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00	LN	9.80	556,000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	MGN	12.30	192,000.00
1.00	2.00	0.00	0.00	0.00	0.00	0.00	1.00	CGN	13.40	194,000.00
1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	MGN	12.60	134,000.00
1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	MGN	13.00	179,000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	FSGS	14.60	287,000.00
1.00	2.00	0.00	0.00	0.00	0.00	0.00	1.00	IGA	12.70	170,000.00
0.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	IGA	16.80	198,000.00
0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	MCD	14.50	392,000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	MCD	13.70	245,000.00
0.00	0.00	1.00	0.00	0.00	0.00	0.00	2.00	CIN	12.70	147,000.00
0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	MGN	12.00	206,000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	LN	13.80	310,000.00
0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	Mes PGN	13.80	245,000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	MGN	13.80	301,000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	MCD	14.80	339,000.00
1.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00	IGA	11.30	277,000.00
1.00	1.00	1.00	1.00	0.00	0.00	0.00	4.00	HTN NS	13.30	154,000.00
0.00	0.00	0.00	1.00	0.00	0.00	0.00	2.00	CIN	12.30	186,000.00
1.00	2.00	0.00	1.00	0.00	0.00	0.00	1.00	RPGN	12.00	450,000.00
1.00	2.00	1.00	1.00	0.00	0.00	0.00	1.00	IGA	9.90	113,000.00
0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	MGN	15.30	325,000.00
0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	DN	11.90	229,000.00
0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	MCD	14.60	281,000.00
1.00	2.00	0.00	0.00	0.00	0.00	0.00	1.00	PIGN	8.90	380,000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	LN	11.50	269,000.00
0.00	0.00	1.00	1.00	1.00	0.00	0.00	2.00	AIN	11.00	185,000.00
0.00	0.00	1.00	0.00	1.00	0.00	0.00	1.00	NDRD	11.40	111,000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	LN	8.30	394,000.00
1.00	2.00	0.00	0.00	0.00	0.00	0.00	1.00	LN	11.50	184,000.00
0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	DN	10.00	171,000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	RPGN	9.80	278,000.00

0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	IGA	10.10	122,000.00
0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	NDRD	13.70	213,000.00
0.00	0.00	1.00	1.00	0.00	0.00	0.00	2.00	CIN	12.30	187,000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	CIN	8.50	171,000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	MGN	14.80	246,000.00
0.00	0.00	0.00	1.00	0.00	0.00	0.00	2.00	CIN	9.20	227,000.00
1.00	2.00	0.00	0.00	0.00	0.00	0.00	1.00	LN	10.00	131,000.00
0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	IGA	14.50	229,000.00
1.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00	MPGN	10.60	193,000.00
0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	LN	13.60	188,000.00
0.00	0.00	0.00	1.00	0.00	0.00	0.00	4.00	HTN NS	13.70	186,000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	FSGS	11.90	122,000.00
1.00	2.00	0.00	1.00	1.00	0.00	0.00	1.00	CGN	10.10	116,000.00
0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	IGA	14.70	275,000.00
1.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00	PIGN	10.00	303,000.00
1.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00	CGN	11.00	398,000.00
1.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00	IGA	14.00	157,000.00
0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	FSGS	13.20	110,000.00
0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	MYELOMA	11.40	369,000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	MGN	11.00	307,000.00
1.00	1.00	0.00	1.00	0.00	0.00	0.00	1.00	RPGN	10.40	152,000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	CIN	9.60	273,000.00
1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	MGN	12.10	359,000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	FSGS	15.60	290,000.00
0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	FSGS	8.70	169,000.00
1.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00	CGN	8.90	188,000.00
0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	IGA	8.30	284,000.00
0.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	PIGN	9.60	133,000.00
1.00	1.00	0.00	1.00	0.00	0.00	0.00	1.00	RPGN	14.00	495,000.00
0.00	0.00	0.00	1.00	0.00	0.00	0.00	2.00	CIN	16.10	223,000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	AIN	10.00	141,000.00
0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	DN	9.10	280,000.00
0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	CGN	10.00	166,000.00
1.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00	RPGN	8.40	120,000.00
1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	MGN	8.60	127,000.00
0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	CGN	10.00	201,000.00

0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	LN	11.50	122,000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	CIN	11.80	255,000.00
0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	DN	11.20	203,000.00
1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	IGA	11.70	138,000.00
1.00	1.00	0.00	0.00	0.00	0.00	0.00	3.00	CIN	10.20	301,000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	DN	8.00	172,000.00
1.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00	IGA	10.70	206,000.00
1.00	2.00	1.00	1.00	0.00	0.00	0.00	0.00	DN	8.20	153,000.00
1.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	IGA	8.90	191,000.00
1.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	MCD	10.10	261,000.00
0.00	0.00	1.00	1.00	1.00	0.00	0.00	2.00	CIN	12.40	116,000.00
0.00	0.00	0.00	1.00	0.00	0.00	0.00	2.00	AIN	12.30	259,000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	HTN NS	11.00	239,000.00
0.00	0.00	0.00	1.00	0.00	0.00	0.00	2.00	CIN	10.00	169,000.00
0.00	0.00	0.00	1.00	0.00	0.00	0.00	2.00	CIN	10.60	160,000.00
0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	DN	9.20	236,000.00
1.00	1.00	0.00	0.00	0.00	0.00	0.00	2.00	CIN	8.60	214,000.00
1.00	1.00	0.00	1.00	0.00	0.00	0.00	2.00	CIN	8.20	218,000.00
0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	RPGN	11.80	120,000.00
1.00	2.00	0.00	1.00	0.00	0.00	0.00	1.00	RPGN	9.30	272,000.00
0.00	0.00	0.00	1.00	0.00	0.00	0.00	2.00	CIN	11.00	274,000.00
0.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00	IGA	9.80	181,000.00
1.00	2.00	0.00	0.00	0.00	0.00	0.00	1.00	IGA	11.90	168,000.00
1.00	1.00	0.00	1.00	0.00	0.00	1.00	1.00	IGA	15.10	240,000.00
0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	MCD	12.60	275,000.00
0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00	NDRD	10.40	207,000.00
0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	CGN	8.80	423,000.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	CGN	9.40	169,000.00
0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	DN	10.00	441,000.00
1.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	MGN	15.10	162,000.00
0.00	0.00	1.00	1.00	0.00	0.00	0.00	2.00	CIN	11.10	113,000.00
1.00	2.00	0.00	1.00	0.00	0.00	0.00	1.00	IGA	9.80	170,000.00
1.00	2.00	0.00	1.00	0.00	0.00	0.00	1.00	IGA	10.10	150,000.00

ptINR	Aptt	HIV	HBsAg	HCV	urineanalysis	WBC	CASTS	CRYstals	Blood	protein
10.00	28.10	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	3.00
10.80	28.70	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	2.00
9.80	25.70	0.00	0.00	0.00	1.00	2.00	0.00	0.00	3.00	2.00
11.20	28.40	0.00	0.00	0.00	1.00	1.00	4.00	0.00	0.00	2.00
10.30	30.40	0.00	0.00	0.00	1.00	1.00	4.00	0.00	2.00	3.00
10.50	29.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	3.00	3.00
10.60	36.50	0.00	0.00	0.00	1.00	0.00	0.00	0.00	2.00	2.00
9.80	35.60	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	3.00
10.70	35.70	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	2.00
11.90	31.70	0.00	0.00	0.00	1.00	1.00	4.00	0.00	3.00	1.00
11.40	29.40	0.00	0.00	0.00	1.00	0.00	4.00	0.00	1.00	2.00
11.40	42.30	0.00	0.00	0.00	1.00	0.00	4.00	0.00	1.00	3.00
12.40	44.30	0.00	0.00	0.00	1.00	0.00	4.00	0.00	1.00	2.00
12.50	30.30	0.00	0.00	0.00	1.00	0.00	4.00	0.00	0.00	2.00
10.60	33.00	0.00	0.00	0.00	1.00	0.00	4.00	0.00	2.00	3.00
10.30	32.80	0.00	0.00	0.00	1.00	0.00	4.00	0.00	1.00	3.00
11.80	28.40	0.00	0.00	0.00	1.00	0.00	0.00	0.00	2.00	3.00
10.40	33.50	0.00	0.00	0.00	1.00	0.00	4.00	0.00	2.00	3.00
10.50	32.00	0.00	0.00	0.00	1.00	0.00	4.00	0.00	2.00	3.00
10.30	33.20	0.00	0.00	0.00	1.00	1.00	0.00	0.00	2.00	3.00
11.10	29.50	0.00	0.00	0.00	1.00	0.00	0.00	0.00	2.00	1.00
10.50	29.20	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
11.40	27.90	0.00	0.00	0.00	1.00	0.00	1.00	0.00	3.00	2.00
10.70	25.70	0.00	0.00	0.00	1.00	0.00	4.00	0.00	3.00	2.00
10.30	24.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	3.00
11.00	33.70	0.00	0.00	0.00	1.00	0.00	3.00	0.00	2.00	3.00
10.90	34.10	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	2.00
11.90	32.20	0.00	0.00	0.00	1.00	1.00	4.00	0.00	3.00	1.00
10.60	31.70	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	2.00
10.90	29.50	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
10.90	30.10	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
11.70	33.60	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
9.70	35.00	0.00	0.00	0.00	1.00	0.00	4.00	0.00	2.00	3.00
9.90	25.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	3.00
11.10	35.30	0.00	0.00	0.00	1.00	1.00	4.00	0.00	2.00	3.00

10.30	31.60	0.00	0.00	0.00	1.00	1.00	4.00	0.00	3.00	2.00
10.30	25.50	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
10.70	31.60	0.00	0.00	0.00	1.00	0.00	0.00	0.00	2.00	1.00
11.90	28.10	0.00	0.00	0.00	1.00	0.00	4.00	0.00	2.00	1.00
9.80	28.10	0.00	0.00	0.00	1.00	1.00	0.00	0.00	2.00	3.00
10.70	27.10	0.00	0.00	0.00	1.00	1.00	4.00	0.00	0.00	0.00
10.40	28.20	0.00	0.00	0.00	1.00	1.00	4.00	0.00	3.00	2.00
11.40	27.30	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
10.30	33.80	0.00	0.00	0.00	1.00	1.00	4.00	0.00	2.00	4.00
10.00	34.10	0.00	0.00	0.00	1.00	1.00	4.00	0.00	1.00	3.00
10.60	26.20	0.00	0.00	0.00	1.00	0.00	4.00	0.00	1.00	2.00
11.40	34.10	0.00	0.00	0.00	1.00	0.00	4.00	0.00	1.00	3.00
11.50	32.70	0.00	0.00	0.00	1.00	1.00	4.00	0.00	2.00	3.00
11.30	25.20	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	1.00
10.90	32.00	0.00	0.00	0.00	1.00	1.00	4.00	0.00	2.00	3.00
11.40	36.30	0.00	0.00	0.00	1.00	0.00	0.00	0.00	3.00	1.00
10.80	28.70	0.00	0.00	0.00	1.00	0.00	0.00	0.00	2.00	0.00
10.50	28.90	0.00	0.00	0.00	1.00	0.00	4.00	0.00	0.00	1.00
9.80	27.00	0.00	0.00	0.00	1.00	0.00	4.00	0.00	1.00	3.00
10.80	28.10	0.00	0.00	0.00	1.00	0.00	0.00	0.00	2.00	3.00
12.20	29.00	0.00	0.00	0.00	1.00	2.00	4.00	0.00	0.00	1.00
10.70	34.80	0.00	0.00	0.00	1.00	0.00	3.00	0.00	0.00	0.00
10.50	35.30	0.00	0.00	0.00	1.00	2.00	0.00	0.00	0.00	3.00
10.40	33.60	0.00	0.00	0.00	1.00	1.00	4.00	0.00	0.00	3.00
10.10	26.70	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	2.00
11.30	29.10	0.00	0.00	0.00	1.00	0.00	4.00	0.00	3.00	3.00
11.00	33.20	0.00	0.00	0.00	1.00	0.00	4.00	0.00	0.00	1.00
9.70	33.10	0.00	0.00	0.00	1.00	0.00	0.00	0.00	2.00	2.00
11.90	34.50	0.00	0.00	0.00	1.00	1.00	4.00	0.00	3.00	2.00
13.20	29.60	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
11.90	32.30	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00
10.50	35.40	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
11.90	29.20	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	3.00
11.10	43.50	0.00	0.00	0.00	1.00	0.00	4.00	0.00	2.00	3.00
10.80	32.10	0.00	0.00	0.00	1.00	0.00	0.00	0.00	2.00	3.00
#NULL!	#NULL!	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	2.00

11.10	31.60	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	2.00
11.80	32.00	0.00	0.00	0.00	1.00	0.00	4.00	0.00	0.00	2.00
10.90	30.10	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	2.00
11.90	30.70	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
10.90	31.70	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
11.90	32.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	2.00	2.00
10.60	28.70	0.00	0.00	0.00	1.00	0.00	0.00	0.00	2.00	2.00
11.30	37.60	0.00	0.00	0.00	1.00	1.00	0.00	0.00	2.00	4.00
10.00	26.20	0.00	0.00	0.00	1.00	0.00	4.00	0.00	2.00	3.00
9.50	34.50	0.00	0.00	0.00	1.00	2.00	0.00	0.00	3.00	4.00
10.60	26.50	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
9.60	26.30	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
11.10	33.40	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
9.70	24.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	2.00	1.00
10.20	24.20	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	2.00
10.30	29.50	0.00	0.00	0.00	1.00	0.00	4.00	0.00	2.00	3.00
10.20	35.10	0.00	0.00	0.00	1.00	0.00	4.00	0.00	3.00	1.00
10.50	30.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	2.00
11.30	28.40	0.00	0.00	0.00	1.00	0.00	4.00	0.00	0.00	2.00
11.70	32.50	0.00	0.00	0.00	1.00	0.00	0.00	0.00	2.00	2.00
11.00	27.70	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
10.40	34.30	0.00	0.00	0.00	1.00	0.00	4.00	0.00	1.00	3.00
11.30	42.80	0.00	0.00	0.00	1.00	0.00	0.00	0.00	2.00	3.00
10.30	30.00	0.00	0.00	0.00	1.00	0.00	4.00	0.00	3.00	2.00
10.80	31.80	0.00	0.00	0.00	1.00	0.00	0.00	0.00	2.00	2.00
10.00	35.50	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	4.00
10.60	27.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	2.00
10.60	28.00	0.00	0.00	0.00	1.00	0.00	4.00	0.00	1.00	3.00
10.20	31.00	0.00	0.00	0.00	1.00	0.00	4.00	0.00	1.00	3.00
11.70	37.50	0.00	1.00	0.00	1.00	0.00	0.00	0.00	2.00	0.00
10.30	32.30	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
10.20	33.70	0.00	0.00	0.00	1.00	1.00	0.00	0.00	2.00	4.00
11.90	32.40	0.00	0.00	0.00	1.00	2.00	0.00	0.00	3.00	3.00

urineprotin24hr	UP_UC	urea	totalprotein	albumin	TC	TG	HDL	LDL	c3	c4
1,500.00	15.59	29.00	3.80	1.30	219	180.00	31.00	155.00	48.40	21.10
161.00	0.51	11.00	4.40	1.90	493	244.00	112.00	347.00	129.00	17.30
3,500.00	#NULL!	22.00	4.80	2.30	#NULL!	#NULL!	#NULL!	#NULL!	135.00	28.90
139.00	#NULL!	16.00	7.50	3.10	#NULL!	#NULL!	#NULL!	#NULL!	65.30	6.61
6,600.00	20.44	16.00	3.90	1.50	507	134.00	53.00	431.00	111.00	29.50
5,800.00	#NULL!	21.00	4.90	2.90	250	159.00	45.00	182.00	113.00	21.70
3,100.00	2.71	16.00	7.30	4.00	146	286.00	32.00	72.00	128.00	19.00
3,000.00	4.43	38.00	4.60	2.80	254	128.00	60.00	168.00	130.00	45.80
10,000.00	#NULL!	22.00	5.00	1.70	352	199.00	55.00	267.00	126.00	29.60
163.00	#NULL!	24.00	#NULL!	#NULL!	124	95.00	30.00	84.00	96.20	23.50
1,300.00	#NULL!	22.00	7.10	4.70	106	62.00	42.00	50.00	#NULL!	#NULL!
3,200.00	#NULL!	14.00	3.90	1.50	484	769.00	31.00	351.00	#NULL!	#NULL!
7,790.00	7.79	14.00	3.90	1.80	372	409.00	42.00	277.00	#NULL!	#NULL!
743.00	3.60	11.00	6.80	3.80	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!
10,900.00	#NULL!	21.00	6.50	2.70	237	494.00	38.00	118.00	214.00	52.40
7,900.00	#NULL!	10.00	4.90	2.10	255	131.00	56.00	165.00	163.00	36.30
8,100.00	#NULL!	31.00	4.20	2.00	#NULL!	#NULL!	#NULL!	#NULL!	132.00	34.40
4,200.00	#NULL!	36.00	5.00	1.20	#NULL!	#NULL!	#NULL!	#NULL!	138.00	60.10
5,500.00	7.82	24.00	4.70	2.60	353	103.00	54.00	271.00	125.00	31.60
2,100.00	#NULL!	15.00	5.30	2.90	308	62.00	117.00	200.00	106.00	18.50
100.00	0.09	47.00	8.10	4.70	118	117.00	26.00	78.00	107.00	24.70
979.00	#NULL!	36.00	7.00	4.50	121	283.00	27.00	54.00	113.00	32.90
510.00	#NULL!	34.00	#NULL!	#NULL!	162	210.00	22.00	109.00	159.00	17.90
1,200.00	#NULL!	47.00	6.90	3.90	178	380.00	38.00	92.00	117.00	26.80
9,200.00	#NULL!	28.00	4.90	2.60	430	270.00	72.00	313.00	193.00	54.80
6,500.00	#NULL!	12.00	5.40	2.40	#NULL!	#NULL!	#NULL!	#NULL!	137.00	33.80
2,700.00	#NULL!	12.00	4.50	1.20	318	97.00	29.00	259.00	136.00	86.40
1,200.00	#NULL!	27.00	7.20	4.10	#NULL!	#NULL!	#NULL!	#NULL!	41.00	21.10
329.00	1.07	23.00	7.50	4.30	#NULL!	#NULL!	#NULL!	#NULL!	126.00	20.20
113.00	0.24	41.00	8.00	4.60	157	136.00	26.00	105.00	143.00	38.90
238.00	#NULL!	33.00	6.50	4.10	178	79.00	69.00	96.00	#NULL!	#NULL!
207.00	#NULL!	20.00	7.30	2.70	#NULL!	#NULL!	#NULL!	#NULL!	39.80	5.42
4,700.00	6.64	12.00	4.70	2.50	#NULL!	#NULL!	#NULL!	#NULL!	49.80	10.50
5,000.00	5.24	26.00	7.80	3.80	202	312.00	42.00	123.00	#NULL!	#NULL!
13,840.00	13.84	156.00	6.00	2.70	3	117.00	55.00	226.00	110.00	46.70

1,540.00	1.54	73.00	5.10	2.90	208	158.00	52.00	139.00	#NULL!	#NULL!
1,500.00	#NULL!	17.00	6.60	4.40	128	91.00	32.00	86.00	0.00	0.00
476.00	#NULL!	21.00	7.90	4.60	#NULL!	#NULL!	#NULL!	#NULL!	119.00	25.50
1,300.00	#NULL!	80.00	7.70	4.20	#NULL!	#NULL!	#NULL!	#NULL!	96.80	42.30
10,400.00	#NULL!	18.00	3.90	1.70	624	343.00	45.00	533.00	156.00	50.20
99.00	#NULL!	70.00	8.20	4.70	250	231.00	42.00	167.00	131.00	37.40
2,000.00	#NULL!	25.00	6.00	3.10	140	169.00	24.00	90.00	21.40	5.42
866.00	#NULL!	50.00	7.70	4.80	132	165.00	32.00	76.00	122.00	36.30
4,700.00	#NULL!	26.00	4.50	2.10	302	118.00	82.00	194.00	95.30	23.80
3,100.00	#NULL!	16.00	4.70	2.00	#NULL!	#NULL!	#NULL!	#NULL!	114.00	52.80
506.00	#NULL!	24.00	7.60	4.50	143	98.00	48.00	83.00	#NULL!	#NULL!
4,300.00	#NULL!	20.00	4.80	2.10	291	148.00	72.00	213.00	#NULL!	#NULL!
3,500.00	#NULL!	47.00	6.40	3.60	141	93.00	19.00	117.00	128.00	34.50
81.00	0.20	36.00	7.90	5.10	198	152.00	38.00	143.00	117.00	26.00
6,500.00	5.28	96.00	7.00	3.60	#NULL!	#NULL!	#NULL!	#NULL!	18.40	12.00
815.00	0.65	51.00	7.40	3.90	156	145.00	36.00	82.00	187.00	60.60
50.00	0.05	21.00	7.40	4.70	#NULL!	#NULL!	#NULL!	#NULL!	107.00	34.40
1,800.00	1.74	26.00	6.50	4.30	#NULL!	#NULL!	#NULL!	#NULL!	157.00	48.60
3,200.00	#NULL!	18.00	7.40	4.00	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!
10,900.00	#NULL!	22.00	4.60	1.90	367	414.00	40.00	283.00	86.90	45.40
499.00	#NULL!	136.00	7.30	3.40	#NULL!	#NULL!	#NULL!	#NULL!	110.00	26.50
408.00	#NULL!	36.00	7.60	4.20	114	174.00	22.00	68.00	#NULL!	#NULL!
5,500.00	#NULL!	38.00	5.70	2.80	246	204.00	65.00	145.00	120.00	30.60
10,200.00	10.96	31.00	3.30	1.40	660	703.00	41.00	530.00	161.00	36.40
4,700.00	#NULL!	42.00	4.10	2.10	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!
107.00	9.80	161.00	6.80	4.00	151	153.00	35.00	92.00	124.00	30.60
736.00	1.30	221.00	6.70	3.90	#NULL!	#NULL!	#NULL!	#NULL!	117.00	30.20
1,900.00	3.34	56.00	5.20	3.20	141	65.00	76.00	60.00	81.60	14.60
5,600.00	#NULL!	108.00	5.60	2.90	#NULL!	#NULL!	#NULL!	#NULL!	132.00	31.00
73.00	#NULL!	25.00	7.30	4.50	#NULL!	#NULL!	#NULL!	#NULL!	138.00	54.30
759.00	#NULL!	47.00	8.10	3.90	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!
1,700.00	0.97	42.00	7.30	4.10	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!
2,700.00	#NULL!	36.00	7.10	3.20	#NULL!	#NULL!	#NULL!	#NULL!	129.00	49.40
3,400.00	#NULL!	61.00	6.50	3.00	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!
9,700.00	8.09	35.00	4.90	2.80	#NULL!	#NULL!	#NULL!	#NULL!	129.00	50.20
2,200.00	4.42	41.00	6.20	3.20	180	121.00	52.00	114.00	97.10	27.60

1,100.00	#NULL!	35.00	6.50	3.80	149	187.00	44.00	74.00	101.00	21.20
1,400.00	#NULL!	43.00	6.80	4.50	117	108.00	39.00	70.00	#NULL!	#NULL!
3,000.00	4.04	190.00	6.30	4.10	#NULL!	#NULL!	#NULL!	#NULL!	83.40	34.90
354.00	#NULL!	47.00	7.30	4.70	#NULL!	#NULL!	#NULL!	#NULL!	0.00	0.00
100.00	#NULL!	40.00	7.90	4.20	141	102.00	31.00	93.00	159.00	58.00
4,100.00	3.24	95.00	6.10	3.00	109	37.00	62.00	39.00	89.30	17.50
1,100.00	0.78	60.00	5.70	3.30	168	68.00	29.00	152.00	103.00	40.80
6,700.00	33.98	122.00	6.30	2.70	245	164.00	48.00	164.00	31.60	31.40
1,300.00	#NULL!	93.00	6.60	3.60	166	117.00	45.00	99.00	#NULL!	#NULL!
17,500.00	17.46	61.00	3.50	1.60	487	618.00	35.00	354.00	44.90	13.50
360.00	#NULL!	35.00	8.40	4.50	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!
592.00	#NULL!	119.00	7.20	4.20	#NULL!	#NULL!	#NULL!	#NULL!	126.00	16.10
1,000.00	#NULL!	61.00	6.40	3.70	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!
689.00	#NULL!	90.00	5.80	3.60	209	218.00	51.00	126.00	112.00	39.40
800.00	1.20	51.00	7.80	4.60	174	185.00	35.00	120.00	108.00	15.50
5,500.00	10.75	45.00	4.50	1.50	167	87.00	60.00	94.00	106.00	26.90
1,340.00	1.34	45.00	6.10	3.80	226	225.00	34.00	159.00	113.00	36.70
578.00	#NULL!	142.00	7.00	3.70	106	48.00	52.00	56.00	129.00	58.70
342.00	0.32	47.00	8.20	4.60	#NULL!	#NULL!	#NULL!	#NULL!	99.70	29.30
3,400.00	5.11	236.00	5.70	3.00	#NULL!	#NULL!	#NULL!	#NULL!	88.50	42.00
133.00	0.03	23.00	7.60	4.90	157	85.00	46.00	103.00	105.00	19.30
5,300.00	#NULL!	88.00	7.00	4.10	183	5.00	65.00	108.00	136.00	27.70
4,100.00	3.96	55.00	7.50	4.50	#NULL!	#NULL!	#NULL!	#NULL!	75.40	22.00
2,600.00	#NULL!	38.00	6.00	4.00	199	87.00	50.00	139.00	127.00	35.40
610.00	#NULL!	67.00	5.60	2.70	411	130.00	100.00	262.00	102.00	69.80
8,800.00	#NULL!	52.00	6.60	3.70	#NULL!	#NULL!	#NULL!	#NULL!	135.00	45.90
850.00	#NULL!	106.00	7.70	4.30	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!
2,100.00	0.97	67.00	7.30	4.00	130	128.00	53.00	60.00	128.00	47.70
12,400.00	#NULL!	74.00	5.80	2.60	206	154.00	33.00	155.00	111.00	47.00
988.00	1.53	31.00	8.40	4.00	#NULL!	#NULL!	#NULL!	#NULL!	86.40	34.40
109.00	0.11	42.00	6.80	4.00	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!	#NULL!
5,200.00	#NULL!	88.00	5.60	3.00	#NULL!	#NULL!	#NULL!	#NULL!	81.60	31.30
4,800.00	#NULL!	98.00	5.90	2.80	182	126.00	34.00	125.00	105.00	20.30

ANA	DsDNA	ASO	ADNB	ANCA	CANCA	PANCA	CIS	pred	CNIS	Endoxan	MMF
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00
2.00	665.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00
1.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	733.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
3.00	225.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	300.00	1.00	1.00	0.00	0.00	1.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00
0.00	0.00	776.00	1,040.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
3.00	615.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00

0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
3.00	524.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	253.00	898.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	1.00	0.00	299.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00

1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	135.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	205.00	1,420.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NULL!	0.00	0.00	0.00	0.00

Levamisole	Glomerularcompartment	Intcompt	Tubucompt	Vasccompt	IgG	IgA	IgM	ifC3	ifC4
0.00									
0.00									
0.00									
0.00									
0.00									
0.00									
0.00									
0.00									
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0.00	Mesangial prol	normal	normal	normal	0	0	0	0	0
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0.00	membrane thick	normal	normal	normal	1	0	0	1	0
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C1Q	LC	immuno	electronmicro	histopatho	usgrt	usglft	Echogencity	paren
	#NULL!	#NULL!	#NULL!		10.00	10.60	0.00	#NULL!
	#NULL!	#NULL!	#NULL!		9.90	9.00	2.00	#NULL!
	#NULL!	#NULL!	#NULL!		11.70	11.70	2.00	#NULL!
	#NULL!	#NULL!	#NULL!		10.00	9.50	0.00	#NULL!
	#NULL!	#NULL!	#NULL!		11.30	11.00	1.00	#NULL!
	#NULL!	#NULL!	#NULL!		10.40	10.30	1.00	#NULL!
	#NULL!	#NULL!	#NULL!		11.00	10.90	2.00	#NULL!
	#NULL!	#NULL!	#NULL!		8.30	8.60	0.00	#NULL!
	#NULL!	#NULL!	#NULL!		10.20	11.00	0.00	#NULL!
	#NULL!	#NULL!	#NULL!		12.00	12.50	1.00	#NULL!
	#NULL!	#NULL!	#NULL!		9.40	9.50	1.00	#NULL!
	#NULL!	#NULL!	#NULL!		9.85	9.52	0.00	#NULL!
	#NULL!	#NULL!	#NULL!		12.20	11.90	1.00	#NULL!
	#NULL!	#NULL!	#NULL!		10.80	10.00	1.00	#NULL!
	#NULL!	#NULL!	#NULL!		11.50	12.30	0.00	#NULL!
	#NULL!	#NULL!	#NULL!		11.40	11.20	0.00	#NULL!
0	0	0	0	Resolving PIGN	10.00	10.00	2.00	#NULL!
	#NULL!	#NULL!	#NULL!		9.90	10.50	0.00	#NULL!
	#NULL!	#NULL!	#NULL!		10.40	11.40	0.00	#NULL!
	#NULL!	#NULL!	#NULL!		12.00	11.50	1.00	#NULL!
	#NULL!	#NULL!	#NULL!		8.30	9.10	0.00	#NULL!
	#NULL!	#NULL!	#NULL!		9.00	9.00	2.00	#NULL!
	#NULL!	#NULL!	#NULL!		9.90	10.30	0.00	#NULL!
	#NULL!	#NULL!	#NULL!		8.80	9.00	3.00	#NULL!
0	0	0	0	Menmbranous nephropathy	10.00	10.60	0.00	#NULL!
	#NULL!	#NULL!	#NULL!		9.99	10.80	0.00	#NULL!
	#NULL!	#NULL!	#NULL!		10.60	9.80	0.00	#NULL!
	#NULL!	#NULL!	#NULL!		11.00	9.80	1.00	#NULL!
	#NULL!	#NULL!	#NULL!		10.90	10.50	1.00	#NULL!
	#NULL!	#NULL!	#NULL!		8.30	8.40	1.00	#NULL!
	#NULL!	#NULL!	#NULL!		8.00	8.20	1.00	#NULL!
	#NULL!	#NULL!	#NULL!		10.00	11.20	1.00	#NULL!
	#NULL!	#NULL!	#NULL!		9.60	10.00	0.00	#NULL!
	#NULL!	#NULL!	#NULL!		10.30	10.70	2.00	#NULL!
	#NULL!	#NULL!	#NULL!		10.60	10.00	2.00	#NULL!

	#NULL!	#NULL!	#NULL!			9.50	9.70	1.00	#NULL!
	#NULL!	#NULL!	#NULL!			9.40	10.60	2.00	#NULL!
	#NULL!	#NULL!	#NULL!			9.40	10.50	2.00	#NULL!
	#NULL!	#NULL!	#NULL!			9.00	8.60	2.00	#NULL!
	#NULL!	#NULL!	#NULL!			10.60	10.50	0.00	#NULL!
	#NULL!	#NULL!	#NULL!			9.20	9.00	2.00	#NULL!
	#NULL!	#NULL!	#NULL!			10.50	10.70	1.00	#NULL!
	#NULL!	#NULL!	#NULL!			9.00	10.20	3.00	#NULL!
	#NULL!	#NULL!	#NULL!			10.40	9.50	1.00	#NULL!
	#NULL!	#NULL!	#NULL!			10.60	11.50	1.00	#NULL!
	#NULL!	#NULL!	#NULL!			8.20	9.20	2.00	#NULL!
	#NULL!	#NULL!	#NULL!			9.80	10.40	1.00	1.42
	#NULL!	#NULL!	#NULL!			11.30	12.00	2.00	#NULL!
	#NULL!	#NULL!	#NULL!			8.70	8.40	1.00	#NULL!
	#NULL!	#NULL!	#NULL!			11.40	11.70	0.00	#NULL!
	#NULL!	#NULL!	#NULL!			10.90	10.90	0.00	#NULL!
0	0	0	0	FOCAL PROLIFERATIVE GN		9.70	10.20	0.00	#NULL!
	#NULL!	#NULL!	#NULL!	FOCAL SEGMENTAL GLOMERULOSCLEROSIS		9.80	10.00	1.00	#NULL!
	#NULL!	#NULL!	#NULL!			11.00	11.60	1.00	#NULL!
	#NULL!	#NULL!	#NULL!			11.50	12.20	0.00	#NULL!
	#NULL!	#NULL!	#NULL!			10.10	12.50	2.00	#NULL!
	#NULL!	#NULL!	#NULL!			9.80	9.80	1.00	#NULL!
	#NULL!	#NULL!	#NULL!			10.90	11.50	0.00	#NULL!
	#NULL!	#NULL!	#NULL!			10.70	12.30	2.00	#NULL!
	#NULL!	#NULL!	#NULL!	focal segmental glomeurlosclerosis		9.50	11.30	1.00	#NULL!
	#NULL!	#NULL!	#NULL!			8.90	10.00	3.00	#NULL!
	#NULL!	#NULL!	#NULL!			9.60	9.50	3.00	#NULL!
	#NULL!	0	0	DPGN		11.90	12.00	2.00	#NULL!
	#NULL!	#NULL!	#NULL!			11.30	11.90	1.00	#NULL!
	#NULL!	#NULL!	#NULL!			9.00	9.00	1.00	1.12
	#NULL!	#NULL!	#NULL!			11.29	11.77	1.00	#NULL!
	#NULL!	#NULL!	#NULL!			10.00	10.50	2.00	#NULL!
	#NULL!	#NULL!	#NULL!			10.20	10.90	2.00	#NULL!
	#NULL!	#NULL!	#NULL!			8.20	9.00	1.00	#NULL!
	#NULL!	#NULL!	#NULL!			9.80	9.20	0.00	#NULL!
	#NULL!	#NULL!	#NULL!			8.40	9.00	2.00	#NULL!

	#NULL!	#NULL!	#NULL!	CLASS IV LN WITH CRESCENT IN ONE GLOME	9.20	9.00	1.00	#NULL!
	#NULL!	#NULL!	#NULL!		9.00	8.90	0.00	#NULL!
	#NULL!	#NULL!	#NULL!		9.00	9.50	2.00	#NULL!
	#NULL!	#NULL!	#NULL!		10.10	10.70	2.00	1.12
	#NULL!	#NULL!	#NULL!		10.50	9.90	1.00	#NULL!
	#NULL!	#NULL!	#NULL!		9.80	9.80	2.00	#NULL!
	#NULL!	#NULL!	#NULL!		9.10	10.50	1.00	#NULL!
	#NULL!	#NULL!	#NULL!		10.20	9.50	3.00	#NULL!
	#NULL!	#NULL!	#NULL!		9.00	9.70	2.00	#NULL!
	#NULL!	#NULL!	#NULL!		12.00	13.00	0.00	#NULL!
	#NULL!	#NULL!	#NULL!		8.80	8.50	2.00	#NULL!
	#NULL!	#NULL!	#NULL!		9.00	8.90	1.00	#NULL!
	#NULL!	#NULL!	#NULL!		9.00	10.00	1.00	#NULL!
	#NULL!	#NULL!	#NULL!		8.40	8.90	2.00	#NULL!
	#NULL!	#NULL!	#NULL!		8.00	7.60	1.00	0.94
	#NULL!	#NULL!	#NULL!		9.70	9.60	0.00	#NULL!
	#NULL!	#NULL!	#NULL!		10.70	10.40	0.00	#NULL!
	#NULL!	#NULL!	#NULL!		9.10	8.70	2.00	#NULL!
	#NULL!	#NULL!	#NULL!		9.20	9.20	2.00	#NULL!
	#NULL!	#NULL!	#NULL!		10.50	12.00	2.00	#NULL!
	#NULL!	#NULL!	#NULL!		9.00	8.60	0.00	#NULL!
	#NULL!	#NULL!	#NULL!		11.20	9.80	3.00	#NULL!
	#NULL!	#NULL!	#NULL!		9.20	8.50	2.00	#NULL!
0	0	1	0	AIN WITH ILLDEFINED GRANULOMAS /RENAL	10.20	9.70	2.00	#NULL!
	#NULL!	#NULL!	#NULL!	MINIMAL CHANGE DISESAE	10.70	10.60	1.00	#NULL!
	#NULL!	#NULL!	#NULL!		8.20	10.00	2.00	#NULL!
	#NULL!	#NULL!	#NULL!		9.60	9.10	2.00	#NULL!
	#NULL!	#NULL!	#NULL!		8.30	8.90	2.00	#NULL!
	#NULL!	#NULL!	#NULL!		12.20	13.00	1.00	#NULL!
	#NULL!	#NULL!	#NULL!		12.90	12.90	1.00	#NULL!
	#NULL!	#NULL!	#NULL!		8.30	8.00	1.00	#NULL!
	#NULL!	#NULL!	#NULL!		11.00	11.60	2.00	#NULL!
	#NULL!	#NULL!	#NULL!		10.80	10.70	1.00	#NULL!

ARFIR1	DEPTHR1	ARFIR2	DEPTHR2	ARFIR3	DEPTHR3	ARFIR4	DEPTHR4	ARFIR5	DEPTHR5	MedianR	meanR
0.96	5.40	0.83	5.40	1.29	5.10	0.85	5.30	0.98	5.20	0.96	0.98
2.69	5.80	2.03	5.80	2.23	5.80	2.02	5.70	2.66	5.40	2.23	2.33
1.51	3.30	2.28	5.20	1.35	3.20	2.14	2.80	1.82	4.80	1.82	1.82
2.19	4.30	1.39	4.10	1.15	4.10	1.72	4.10	1.91	4.10	1.72	1.67
1.51	4.50	1.43	4.80	0.97	4.30	1.92	4.30	0.84	4.30	1.43	4.33
1.88	4.60	3.03	3.50	2.49	5.20	3.08	4.10	2.53	4.10	2.53	2.60
0.80	6.20	0.55	6.30	2.08	6.50	0.84	6.90	1.05	5.80	0.84	1.06
2.39	2.70	1.39	3.30	2.17	2.70	1.21	2.70	1.94	2.70	1.94	1.82
1.34	6.40	1.54	6.30	0.52	7.40	1.07	7.40	2.04	6.50	1.21	1.18
1.69	6.30	2.35	6.90	1.33	7.40	2.62	6.50	1.07	5.20	1.80	1.83
2.60	4.80	2.05	4.90	1.36	6.30	1.82	4.80	1.25	6.40	1.82	1.82
2.67	2.80	2.94	3.20	1.97	3.60	2.03	2.80	1.57	3.10	2.03	2.24
3.66	2.60	3.70	2.80	3.01	2.80	2.96	2.80	2.19	3.00	3.01	3.10
1.06	3.60	2.74	3.20	3.15	3.20	3.02	3.00	3.01	3.30	3.01	2.60
3.01	7.10	2.02	7.10	2.05	6.60	2.08	6.50	0.56	6.40	2.05	1.94
3.63	4.90	2.10	4.60	3.86	4.40	3.58	4.40	2.86	4.60	3.58	3.21
2.48	4.20	0.86	6.40	1.40	4.20	2.89	5.20	1.54	4.30	1.54	1.83
1.31	5.70	1.42	5.70	2.22	2.50	2.24	5.10	3.85	5.40	2.22	2.21
1.39	7.30	1.87	7.30	1.75	7.30	1.28	7.30	1.57	7.30	1.57	1.57
1.11	4.10	1.12	4.10	1.27	4.10	1.32	4.10	1.34	4.10	1.27	1.23
0.65	6.70	0.96	5.90	0.92	6.70	0.80	6.20	0.84	5.40	0.84	0.83
1.09	5.70	1.02	5.50	0.85	5.50	0.84	5.70	0.83	5.70	0.85	0.93
1.36	2.90	1.20	3.20	1.42	3.10	#NULL!	#NULL!	#NULL!	#NULL!	1.36	1.33
2.18	3.60	2.44	3.70	2.30	3.70	2.03	3.50	2.28	3.60	2.28	2.25
0.96	5.40	0.83	5.40	1.29	5.10	0.85	5.30	0.98	5.20	0.96	0.98
0.79	7.10	0.76	6.80	0.86	6.80	0.81	7.00	1.34	6.50	0.81	0.91
0.79	4.50	0.76	5.80	0.86	5.60	0.81	6.00	1.34	5.60	0.81	0.91
2.10	4.40	2.26	4.40	2.36	4.40	2.26	3.90	2.60	4.10	2.26	2.34
2.16	8.00	1.82	8.00	1.86	7.40	1.51	7.40	1.48	8.00	1.67	1.69
1.96	5.40	2.05	5.50	1.70	5.30	1.64	7.30	2.13	7.70	1.96	1.90
1.01	5.90	1.17	5.90	1.32	6.00	1.41	6.00	1.62	6.00	1.32	1.31
1.63	6.00	1.47	6.10	1.52	5.10	1.92	5.10	1.95	4.60	1.53	1.68
1.60	5.70	1.90	5.90	1.68	5.40	2.15	5.70	1.40	6.50	1.68	1.75
2.17	5.10	2.33	5.70	2.35	5.40	1.50	4.60	2.45	5.10	2.33	2.16
2.17	3.50	2.49	3.50	2.22	3.50	2.68	3.70	1.86	4.20	2.22	2.28

2.32	4.70	1.81	5.10	1.90	3.90	1.56	5.40	1.43	5.10	1.81	1.80
1.41	7.10	1.62	6.00	1.18	6.40	0.54	6.50	1.09	7.30	1.18	1.17
0.74	6.10	1.55	7.40	1.37	6.30	0.69	7.50	0.80	6.60	0.80	1.30
1.79	5.30	1.13	5.20	2.30	5.50	1.49	4.60	1.81	4.40	1.79	1.70
2.37	4.70	2.93	5.60	1.98	5.00	1.79	5.00	2.20	4.30	2.20	2.25
2.37	5.40	1.67	5.70	1.86	5.00	1.37	4.20	1.35	5.20	1.65	1.67
1.42	7.80	1.63	7.80	1.84	6.80	2.43	7.60	1.19	7.90	1.63	1.70
1.95	7.10	1.64	5.80	1.27	6.20	2.14	6.20	2.62	6.20	1.95	1.92
2.16	4.70	2.76	4.70	1.80	4.50	2.88	6.00	1.97	4.90	2.16	2.31
1.41	6.00	2.15	6.70	0.68	6.00	1.12	5.70	1.55	6.10	1.41	1.38
1.54	5.30	1.74	6.70	0.57	6.80	1.17	4.90	2.00	4.30	1.54	1.40
1.16	6.30	0.85	6.00	0.81	6.10	2.36	6.10	2.06	6.10	1.55	1.53
1.94	3.60	1.53	4.30	3.07	3.60	0.92	4.60	1.80	4.70	1.80	1.85
1.89	5.50	2.45	5.70	0.78	6.10	0.86	5.70	1.08	5.20	1.08	1.41
1.19	7.60	0.67	7.20	1.42	7.20	2.22	7.50	2.41	5.90	1.42	1.68
2.96	5.50	2.88	5.30	1.45	7.20	1.74	8.00	1.51	6.80	1.74	2.11
2.88	5.00	2.76	4.00	1.69	3.70	1.19	4.80	1.44	4.90	1.69	1.99
2.67	5.80	0.71	6.90	0.87	5.30	0.87	6.50	2.12	5.60	0.87	1.43
2.33	6.40	0.55	7.60	0.25	6.00	0.84	7.90	1.94	7.50	1.94	1.58
2.17	3.40	2.39	3.00	3.96	2.70	3.84	2.90	3.38	3.10	3.38	3.15
4.77	4.00	3.59	3.50	1.88	5.70	4.00	3.80	3.55	3.60	3.59	3.59
0.77	5.20	2.70	4.40	1.02	5.20	2.55	4.90	1.48	4.30	1.48	1.70
3.21	4.10	2.44	4.00	2.73	3.80	4.53	4.00	4.17	3.80	3.21	3.42
1.63	7.80	1.81	8.00	1.72	8.00	2.29	7.30	2.18	7.50	1.81	1.93
0.65	5.20	0.69	5.20	0.65	4.70	0.64	4.70	0.97	4.70	0.67	0.72
1.36	5.70	1.28	5.20	0.95	6.10	1.03	6.10	1.57	5.90	1.28	1.24
0.81	5.90	1.00	5.70	1.20	5.90	1.04	5.70	1.07	5.70	1.04	1.02
1.74	6.30	1.53	6.40	1.92	5.90	1.64	6.50	1.63	6.00	1.64	1.69
0.59	5.90	0.60	5.00	0.65	6.70	0.52	5.80	1.06	4.60	0.60	0.68
0.77	7.20	0.89	7.30	1.26	6.60	1.20	7.30	0.85	7.00	0.89	0.99
1.96	5.40	2.05	5.50	1.70	5.30	1.64	7.30	2.13	7.70	1.96	1.90
2.57	4.30	2.26	4.20	1.89	4.20	2.40	4.20	2.32	3.90	2.32	2.29
1.47	5.00	2.04	4.20	2.18	5.60	1.85	4.90	2.00	5.40	2.00	1.91
0.58	6.80	0.69	6.60	0.82	6.60	0.51	6.20	1.22	4.70	0.69	0.76
0.80	4.00	1.04	4.80	1.35	4.40	0.57	3.50	0.85	4.00	0.85	0.92
3.08	3.40	2.46	3.40	2.36	3.50	2.77	3.40	2.69	3.40	2.69	2.67

1.10	7.40	1.89	6.90	1.84	7.00	2.06	6.50	1.92	6.80	1.89	1.76
1.61	6.40	1.76	7.40	1.78	7.90	2.24	7.40	2.19	7.30	1.78	1.92
1.88	4.50	1.65	3.90	1.22	6.10	2.09	5.00	1.72	3.40	1.72	1.71
1.91	5.00	1.75	4.90	2.13	4.50	1.39	4.50	2.01	4.70	1.83	1.71
1.07	5.70	1.78	7.00	1.43	7.00	2.76	7.00	2.06	6.40	1.85	1.84
2.12	5.00	2.77	3.10	1.70	3.50	2.38	5.10	2.42	4.30	2.38	2.28
1.33	2.90	1.74	4.40	1.72	5.20	0.91	5.90	1.91	2.70	1.72	1.52
2.20	4.20	2.95	3.60	1.97	5.20	2.54	3.60	2.68	3.80	2.54	2.47
1.60	5.60	1.11	6.10	1.16	5.20	0.58	6.40	0.62	5.20	1.11	1.01
2.11	3.50	1.43	2.90	1.70	3.60	2.46	4.70	1.54	2.90	1.70	1.85
2.12	5.40	1.60	5.70	1.89	5.00	1.21	4.20	1.22	5.20	1.60	1.61
1.08	7.10	1.34	7.70	1.79	6.60	0.69	7.60	1.59	7.30	1.34	1.30
1.05	5.50	2.47	4.50	1.06	4.20	1.03	4.40	1.35	5.30	1.06	1.39
1.47	6.50	2.30	6.20	1.71	7.30	2.09	5.30	1.15	7.00	1.71	1.74
1.87	5.20	2.38	4.60	0.96	5.00	1.14	4.40	1.08	4.80	1.11	1.39
2.04	4.00	1.36	5.00	2.11	4.60	2.88	3.80	1.80	4.40	2.04	2.04
2.50	5.30	2.03	5.30	1.88	5.60	2.78	5.90	2.99	5.80	2.50	2.44
1.63	6.60	2.30	6.00	2.94	6.30	2.87	5.40	2.60	5.70	2.60	2.47
1.07	5.10	0.66	7.30	0.90	6.90	1.68	7.60	1.77	7.00	1.07	1.22
1.41	6.00	2.15	6.70	0.68	6.00	1.12	5.70	1.55	6.10	1.41	1.38
1.87	5.30	2.74	5.30	1.15	6.40	1.76	5.00	1.48	4.80	1.76	1.80
2.83	2.50	2.29	2.50	1.24	3.60	1.82	3.40	2.06	3.10	2.06	2.05
2.06	3.10	2.93	3.90	2.23	2.50	2.58	3.30	3.59	2.40	2.58	2.68
2.44	5.90	1.09	6.40	0.79	4.70	0.80	5.30	1.39	4.50	1.09	1.30
2.69	4.10	4.02	4.10	3.20	4.10	3.86	4.00	4.25	4.00	3.86	3.60
1.05	3.30	1.96	3.30	1.43	3.50	0.81	5.30	2.35	3.30	1.43	1.52
3.32	6.50	1.39	5.90	2.85	5.70	2.30	5.30	2.78	5.30	2.78	2.53
2.30	7.00	1.23	5.90	1.09	5.80	2.67	4.90	1.74	6.30	1.74	1.81
2.56	6.90	1.29	7.30	1.31	6.70	2.28	6.00	0.82	7.60	1.31	1.65
2.68	4.70	1.99	5.90	1.35	4.20	2.29	5.50	3.45	5.20	2.29	2.35
1.36	4.30	0.86	4.80	3.56	4.40	1.71	5.50	1.75	4.90	1.71	1.85
2.50	3.00	0.93	3.50	3.43	2.80	2.94	2.90	2.33	2.90	2.50	2.43
2.28	5.60	2.80	5.40	0.84	7.50	0.77	6.50	1.06	5.10	1.06	1.55

SDR	IORR	VAR00002	ARFIL1	DEPTHL1	ARFIL2	DEPTHL2	ARFIL3	DEPTHL3	ARFIL4	DEPTHL4	ARFIL5
0.18	0.30	#NULL!	0.64	4.60	0.92	4.80	1.11	4.10	1.40	5.30	0.87
0.33	0.65	#NULL!	1.54	5.20	1.75	4.80	1.87	4.90	1.42	4.80	1.68
0.40	0.78	#NULL!	1.55	3.80	2.56	4.80	2.47	3.90	2.03	3.80	1.15
0.41	0.78	#NULL!	1.90	3.90	2.36	4.00	1.33	4.00	0.53	3.30	1.57
0.44	0.81	#NULL!	1.22	4.90	2.21	4.30	1.39	4.90	2.23	3.50	3.77
0.49	0.87	#NULL!	1.12	5.10	1.34	3.10	2.64	3.80	1.66	4.30	2.34
0.60	0.89	#NULL!	2.74	5.00	0.60	5.70	1.51	4.20	1.01	4.40	2.33
0.50	0.98	#NULL!	2.70	3.80	2.74	2.80	3.08	3.20	3.21	2.20	4.13
0.59	0.99	#NULL!	0.55	4.60	0.85	5.40	1.38	4.00	0.53	4.10	1.01
0.59	1.02	#NULL!	1.90	6.00	1.06	5.60	2.68	5.80	1.94	7.00	2.54
0.55	1.02	#NULL!	2.66	5.30	2.29	4.20	1.64	5.90	1.42	5.40	1.36
0.56	1.04	#NULL!	0.78	3.80	1.45	5.00	0.89	4.60	0.61	3.10	1.91
0.62	1.10	#NULL!	2.36	4.70	2.48	4.50	2.84	4.90	2.76	4.90	1.57
0.87	1.19	#NULL!	1.46	5.10	2.22	5.10	2.00	5.10	1.24	5.10	1.97
0.88	1.26	#NULL!	1.28	7.40	1.24	7.40	2.22	8.00	1.75	7.50	1.51
0.72	1.27	#NULL!	3.84	4.90	3.51	5.20	3.41	4.70	2.29	6.90	3.54
0.83	1.56	#NULL!	1.25	3.90	1.55	3.50	1.74	5.30	3.06	6.20	2.16
1.02	1.68	#NULL!	1.89	5.60	1.22	5.50	1.29	5.40	2.04	5.30	1.70
0.24	0.47	#NULL!	1.80	7.90	2.08	7.90	1.80	8.00	1.53	8.00	1.99
0.11	0.21	#NULL!	1.86	5.00	1.51	5.00	1.83	5.00	1.38	5.30	1.56
0.12	0.21	#NULL!	2.13	6.10	1.07	5.10	1.86	5.30	1.51	5.00	0.92
0.12	0.22	#NULL!	0.74	7.00	1.66	6.90	1.60	6.80	1.74	7.10	1.64
0.11	0.22	#NULL!	1.21	3.30	1.58	3.10	1.06	3.60	#NULL!	#NULL!	#NULL!
0.15	0.26	#NULL!	1.82	4.90	1.84	5.20	1.70	5.20	1.46	5.50	1.98
0.18	0.30	#NULL!	0.64	4.60	0.92	4.80	1.11	4.10	1.40	5.30	0.87
0.24	0.32	#NULL!	1.13	6.30	1.02	6.30	1.05	6.80	1.64	6.50	1.59
0.24	0.32	#NULL!	1.13	4.50	1.02	5.60	1.05	5.80	1.64	5.60	1.59
0.68	0.35	#NULL!	2.25	3.90	1.45	3.90	2.83	3.90	2.32	3.90	2.54
0.31	0.38	#NULL!	2.03	6.50	1.93	6.50	2.48	6.50	1.51	6.80	1.50
0.22	0.42	#NULL!	1.45	5.90	2.22	6.50	1.57	6.00	2.13	5.50	2.61
0.23	0.43	#NULL!	1.19	4.90	2.24	4.60	1.37	4.90	2.44	5.30	1.10
0.24	0.44	#NULL!	0.95	5.30	0.79	5.00	1.35	5.00	1.35	4.30	2.98
0.29	0.53	#NULL!	1.70	5.00	1.54	5.00	1.72	6.00	1.41	6.10	1.62
0.38	0.56	#NULL!	1.43	6.10	1.38	6.50	1.74	7.50	1.86	5.90	1.89
0.31	0.57	#NULL!	2.54	3.40	2.76	3.50	2.93	3.30	2.56	2.80	2.78

0.34	0.61	#NULL!	1.53	5.00	0.54	5.40	1.74	5.20	1.40	6.20	2.09
0.41	0.70	#NULL!	2.25	5.30	2.07	5.60	2.55	5.40	1.37	5.90	0.58
0.43	0.74	#NULL!	1.86	5.80	0.83	5.80	0.83	6.80	0.81	7.20	0.86
0.43	0.74	#NULL!	0.61	5.70	1.53	5.20	1.08	5.80	1.81	5.10	1.14
0.44	0.76	#NULL!	0.72	4.20	0.61	5.90	2.02	4.50	1.95	5.90	1.74
0.40	0.80	#NULL!	1.25	5.30	0.95	5.40	1.87	5.70	1.37	6.40	0.97
0.47	0.83	#NULL!	1.89	5.40	2.68	5.70	2.02	5.70	2.88	5.50	2.20
0.51	0.92	#NULL!	1.80	5.10	2.55	4.60	2.06	5.60	1.57	6.00	2.94
0.48	0.93	#NULL!	1.96	4.10	1.74	4.80	2.28	3.40	1.78	3.30	1.92
0.54	0.95	#NULL!	1.15	5.30	0.89	5.20	1.13	5.10	1.68	5.50	0.95
0.56	1.00	#NULL!	0.79	6.30	0.91	6.30	2.88	6.80	2.03	7.30	0.66
0.67	1.21	#NULL!	1.95	6.10	1.20	5.90	1.12	5.90	2.56	5.40	1.31
0.79	1.28	#NULL!	1.59	4.40	1.98	3.80	2.54	3.00	1.94	4.00	2.22
0.73	1.35	#NULL!	2.04	5.70	1.81	5.10	1.10	6.20	1.59	4.70	2.51
0.73	1.39	#NULL!	2.78	5.90	0.68	6.90	4.31	7.90	1.50	7.10	3.10
0.75	1.44	#NULL!	1.95	5.10	2.09	5.50	1.06	6.60	2.09	5.10	1.86
0.78	1.50	#NULL!	1.36	3.60	1.53	4.10	2.03	4.20	1.45	3.60	0.63
0.85	1.55	#NULL!	0.63	6.60	1.91	6.30	0.53	5.80	3.75	6.70	3.01
0.83	1.59	#NULL!	3.99	5.60	0.55	6.40	2.28	6.00	0.60	6.40	2.66
0.83	1.62	#NULL!	1.68	5.10	1.95	3.80	2.43	3.80	3.06	3.50	0.96
1.06	1.67	#NULL!	2.72	3.50	3.76	3.40	2.72	4.90	3.77	3.20	3.99
0.88	1.73	#NULL!	0.89	5.20	1.29	4.90	1.76	4.80	1.46	4.80	2.07
0.90	1.76	#NULL!	2.20	3.20	3.03	3.00	3.79	2.90	3.09	2.70	1.45
0.29	0.57	#NULL!	2.41	5.60	2.56	7.20	1.64	7.10	2.60	7.10	1.86
0.13	0.09	#NULL!	0.74	5.50	0.88	5.30	1.30	5.30	0.95	5.20	0.74
0.25	0.18	#NULL!	1.11	6.70	1.54	6.40	1.12	6.60	1.00	6.40	1.49
0.14	0.23	#NULL!	1.07	4.40	2.39	4.20	1.64	3.80	0.75	5.70	1.55
0.15	0.25	#NULL!	2.15	6.80	2.23	6.40	1.90	5.40	1.99	6.30	1.96
0.22	0.31	#NULL!	0.95	6.50	2.53	5.70	2.13	7.20	1.84	6.20	1.41
0.22	0.42	#NULL!	2.61	6.00	1.41	6.30	1.72	6.60	1.84	6.50	2.13
0.22	0.42	#NULL!	1.45	5.90	2.22	6.50	1.57	6.00	2.13	5.50	2.61
0.25	0.42	#NULL!	2.85	3.90	2.69	3.90	3.02	3.90	3.42	3.60	1.60
0.27	0.45	#NULL!	1.19	4.70	2.07	4.30	1.82	3.80	2.70	4.00	2.63
0.28	0.48	#NULL!	0.63	7.60	2.08	4.90	1.64	4.00	2.03	3.40	1.85
0.29	0.51	#NULL!	2.05	4.50	1.71	4.00	1.98	4.00	1.79	5.50	2.09
0.28	0.52	#NULL!	2.65	4.60	2.01	4.60	3.06	4.50	3.36	4.40	3.50

0.38	0.52	#NULL!	1.71	6.40	1.58	6.40	1.52	6.40	1.59	6.40	2.03
0.28	0.53	#NULL!	0.91	5.00	1.23	5.10	0.87	4.70	1.18	4.40	1.88
0.32	0.55	#NULL!	1.88	4.70	1.90	5.00	2.10	3.40	2.25	5.20	1.53
0.40	0.62	#NULL!	1.59	4.60	1.29	4.90	1.87	3.60	2.69	3.10	2.96
0.58	0.63	#NULL!	1.91	7.90	1.88	7.70	0.85	7.60	2.17	7.60	2.33
0.40	0.69	#NULL!	1.25	6.40	0.77	7.60	0.94	8.00	2.31	7.50	1.57
0.40	0.71	#NULL!	1.58	3.40	1.73	3.30	1.23	3.40	1.63	3.40	1.19
0.39	0.73	#NULL!	2.40	3.90	2.77	4.60	3.22	3.60	2.62	3.60	3.83
0.42	0.78	#NULL!	0.70	5.10	0.68	6.00	0.88	5.40	0.79	4.80	1.05
0.43	0.80	#NULL!	3.25	3.00	1.70	4.70	3.35	3.00	2.34	3.30	3.24
0.40	0.80	#NULL!	1.21	5.30	0.95	5.40	1.84	5.70	1.27	6.40	0.93
0.43	0.80	#NULL!	0.55	6.90	1.99	6.50	1.77	4.90	1.23	6.10	1.84
0.62	0.87	#NULL!	1.64	4.40	1.41	5.90	2.28	5.10	2.06	4.60	1.64
0.46	0.88	#NULL!	1.27	6.50	1.61	4.90	1.19	5.40	2.00	6.50	1.68
0.60	0.91	#NULL!	0.90	4.70	1.47	4.40	1.30	4.30	1.72	4.50	1.54
0.55	0.92	#NULL!	2.03	5.40	1.64	4.00	1.10	4.50	0.72	5.40	1.91
0.48	0.94	#NULL!	2.30	5.30	1.79	5.70	1.67	5.20	2.54	4.90	1.96
0.53	0.94	#NULL!	4.36	4.40	3.29	4.20	2.73	4.60	3.74	4.00	4.29
0.49	0.95	#NULL!	2.59	6.40	2.31	6.60	1.82	5.70	1.99	7.70	1.41
0.54	0.95	#NULL!	1.15	5.30	0.89	5.20	1.13	5.10	1.68	5.50	0.95
0.59	0.99	#NULL!	1.43	6.00	3.57	6.00	2.92	5.60	3.90	5.40	1.65
0.59	1.03	#NULL!	1.88	2.90	2.06	4.30	2.27	3.10	2.79	3.90	1.53
0.61	1.11	#NULL!	1.93	3.50	1.47	3.30	1.66	3.60	1.78	3.30	1.74
0.68	1.12	#NULL!	0.57	6.60	2.02	5.30	0.85	6.50	2.31	6.80	2.05
0.64	1.19	#NULL!	3.02	4.00	2.85	4.20	3.65	4.70	3.83	4.70	2.98
0.64	1.23	#NULL!	1.65	4.10	1.21	3.60	1.47	3.20	1.28	3.60	1.22
0.73	1.25	#NULL!	0.69	6.00	1.23	5.60	1.11	5.10	1.15	6.50	1.60
0.68	1.33	#NULL!	0.78	5.80	1.52	5.20	1.83	4.80	1.55	4.60	2.17
0.73	1.36	#NULL!	2.06	6.80	2.32	7.50	3.33	6.10	1.37	7.00	2.29
0.78	1.40	#NULL!	1.23	6.30	1.50	7.70	2.16	6.50	2.25	6.90	1.39
1.02	1.55	#NULL!	0.64	6.50	0.68	5.40	0.84	6.10	0.82	5.80	1.78
0.94	1.56	#NULL!	0.84	3.60	2.15	3.90	2.12	5.60	2.86	3.50	2.35
0.93	1.73	#NULL!	2.66	4.50	1.68	5.40	1.44	4.00	2.07	3.70	2.47

DEPTHL5	MedianL	meanL	SDL	IORL	ARFI	MedianF	VAR00001	MeanF	SDF	IQRF	Cysts	Calculi
5.30	0.92	0.99	0.28	0.49	0.94	#NULL!		0.99	0.23	0.26	0.00	0.00
4.80	1.68	1.65	0.18	0.33	1.95	1.00		1.99	0.43	0.55	0.00	0.00
3.40	2.03	1.95	0.60	1.17	1.92	1.00		1.89	0.49	0.77	0.00	0.00
3.40	1.57	1.64	0.68	1.20	1.65	1.00		1.60	0.54	0.68	0.00	0.00
4.60	2.21	2.16	1.01	1.69	1.47	#NULL!		1.75	0.85	0.99	0.00	0.00
4.30	1.66	1.82	0.65	1.26	2.42	#NULL!		2.21	0.68	0.98	0.00	0.00
4.40	1.51	1.64	0.89	1.73	1.03	#NULL!		1.35	0.78	1.28	0.00	0.00
2.30	3.08	3.17	0.58	0.95	2.55	#NULL!		2.50	0.88	1.14	0.00	0.00
5.40	0.85	0.86	0.35	0.65	1.01	#NULL!		1.03	0.50	0.83	0.00	0.00
5.20	1.94	2.02	0.64	1.13	1.90	#NULL!		1.92	0.59	1.21	0.00	0.00
4.20	1.64	1.87	0.57	1.09	1.73	#NULL!		1.85	0.53	0.93	0.00	0.00
3.90	0.89	1.13	0.54	0.98	1.74	1.00		1.68	0.78	1.14	0.00	0.00
4.70	2.48	2.40	0.50	0.83	2.48	1.00		2.80	0.55	0.65	0.00	0.00
4.80	1.97	1.78	0.41	0.76	2.11	#NULL!		2.19	0.77	1.55	0.00	0.00
7.60	1.51	1.60	0.40	0.73	1.89	#NULL!		1.77	0.67	0.80	0.00	0.00
5.10	3.51	3.32	0.60	0.84	3.53	1.00		3.26	0.63	0.77	0.00	0.00
4.10	1.74	1.95	0.70	1.21	1.65	#NULL!		1.89	0.73	1.08	0.00	0.00
5.40	1.70	1.63	0.36	0.72	1.80	1.00		1.92	0.78	0.91	0.00	0.00
8.00	1.80	1.84	0.21	0.37	1.78	1.00		1.71	0.26	0.34	0.00	0.00
5.60	1.56	1.63	0.21	0.40	1.36	#NULL!		1.43	0.26	0.29	0.00	0.00
5.00	1.51	1.50	0.51	1.00	0.94	#NULL!		1.17	0.50	0.67	0.00	0.00
6.90	1.64	1.48	0.41	0.53	1.06	#NULL!		1.20	0.41	0.80	0.00	0.00
#NULL!	1.21	1.28	0.27	0.52	1.29	#NULL!		1.31	0.19	0.22	0.00	0.00
5.40	1.82	1.76	0.19	0.33	2.01	#NULL!		2.00	0.30	0.46	0.00	0.00
5.30	0.92	0.99	0.28	0.49	0.94	#NULL!		0.99	0.23	0.26	0.00	0.00
6.50	1.28	1.31	0.28	0.54	1.05	#NULL!		1.13	0.32	0.62	0.00	0.00
5.60	1.28	1.31	0.28	0.54	1.05	#NULL!		1.13	0.32	0.62	0.00	0.00
3.20	2.32	2.28	0.52	0.83	2.26	#NULL!		2.14	0.60	0.53	0.00	0.00
6.80	1.72	1.78	0.45	0.56	1.67	#NULL!		1.74	0.37	0.50	0.00	0.00
4.20	2.13	2.00	0.48	0.91	2.01	#NULL!		1.96	0.36	0.49	0.00	0.00
5.00	1.98	1.84	0.54	1.06	1.39	#NULL!		1.58	0.49	0.79	0.00	0.00
4.60	1.35	1.48	0.87	1.30	1.50	#NULL!		1.58	0.61	0.57	0.00	0.00
6.20	1.62	1.60	0.13	0.23	1.65	1.00		1.67	0.22	0.18	0.00	0.00
5.90	1.74	1.66	0.24	0.48	1.88	#NULL!		1.91	0.40	0.83	0.00	0.00
3.00	2.76	2.71	0.16	31.00	2.55	#NULL!		2.50	0.33	0.54	0.00	0.00

4.80	1.53	1.46	0.58	0.95	1.65	#NULL!	1.63	0.48	0.47	0.00	0.00
6.50	2.07	1.76	0.79	1.42	1.39	#NULL!	1.47	0.67	0.98	0.00	0.00
6.60	0.83	1.34	0.46	0.54	0.83	#NULL!	1.03	0.41	0.57	0.00	0.00
4.50	1.14	1.23	0.46	0.82	1.51	#NULL!	1.47	0.49	0.68	0.00	0.00
4.40	1.74	1.41	0.69	1.32	1.97	#NULL!	1.83	0.70	0.46	0.00	0.00
5.60	1.32	1.37	0.37	0.62	1.37	#NULL!	1.47	0.41	0.63	0.00	0.00
5.50	2.20	2.33	0.43	0.82	1.96	1.00	2.02	0.54	0.80	0.00	0.00
5.40	2.06	2.18	0.56	1.06	2.01	#NULL!	2.05	0.52	0.91	0.00	0.00
3.80	1.92	1.94	0.21	0.36	1.97	#NULL!	2.13	0.40	0.48	0.00	0.00
5.90	1.13	1.16	0.31	0.50	1.14	#NULL!	1.27	0.43	0.60	#NULL!	0.00
7.40	0.91	1.45	0.97	1.73	1.36	#NULL!	1.43	0.74	1.21	0.00	0.00
5.80	1.31	1.63	0.62	1.10	1.31	#NULL!	1.57	0.62	0.94	0.00	0.00
3.80	1.98	2.05	0.35	0.61	1.94	#NULL!	1.95	0.58	0.63	0.00	0.00
5.50	1.81	1.81	0.52	0.93	1.70	#NULL!	1.61	0.63	0.96	0.00	0.00
4.50	2.78	2.47	1.42	2.62	1.86	#NULL!	2.03	1.16	1.59	0.00	0.00
5.40	1.95	1.97	0.66	1.04	1.91	#NULL!	2.04	0.67	1.37	0.00	0.00
6.30	1.45	1.40	0.50	0.78	1.49	#NULL!	1.70	0.69	0.67	0.00	0.00
5.00	1.91	1.97	1.43	2.80	1.39	#NULL!	1.70	1.14	1.86	0.00	0.00
6.20	2.28	2.02	1.46	2.76	2.09	1.00	1.80	1.14	1.73	0.00	0.00
4.40	1.97	2.01	0.71	0.75	2.39	#NULL!	2.53	0.93	1.43	0.00	0.00
3.40	3.76	3.39	0.62	1.16	3.68	#NULL!	3.47	0.82	1.27	0.00	0.00
4.70	1.46	1.49	0.45	0.83	1.47	#NULL!	1.60	0.67	1.05	0.00	0.00
2.80	3.03	2.71	0.90	1.61	3.06	#NULL!	3.06	0.93	1.35	0.00	0.00
6.60	2.41	2.21	0.44	0.83	2.02	1.00	2.07	0.38	0.69	0.00	0.00
5.50	0.88	0.92	0.23	0.39	0.74	#NULL!	0.81	0.20	0.30	0.00	0.00
6.50	1.12	1.25	0.25	0.46	1.20	#NULL!	1.25	0.23	0.46	0.00	0.00
5.00	1.55	1.48	0.62	1.11	1.07	#NULL!	1.25	0.49	0.55	0.00	0.00
6.00	1.99	2.05	0.14	0.26	1.91	#NULL!	1.87	0.23	0.36	0.00	0.00
6.20	1.84	1.77	0.62	1.15	1.00	#NULL!	1.02	0.72	1.24	0.00	0.00
5.20	1.84	1.94	0.45	0.80	1.34	#NULL!	1.47	0.60	0.95	0.00	0.00
4.20	2.13	2.00	0.48	0.91	2.01	#NULL!	1.96	0.36	0.49	0.00	0.00
4.50	2.85	2.72	0.68	1.07	2.49	#NULL!	2.50	0.53	0.59	0.00	0.00
3.10	2.07	2.08	0.62	1.16	2.02	#NULL!	2.00	0.46	0.36	0.00	0.00
3.90	1.85	1.65	0.59	0.91	1.02	#NULL!	1.20	0.64	1.22	0.00	0.00
3.70	1.98	1.92	0.17	0.32	1.53	#NULL!	1.42	0.57	1.13	0.00	0.00
4.40	3.06	2.92	0.60	1.10	2.73	#NULL!	2.79	0.45	0.62	0.00	0.00

6.30	1.59	1.69	0.20	0.32	1.78	#NULL!	1.70	0.29	0.34	0.00	0.00
4.50	1.18	1.21	0.40	0.67	1.69	#NULL!	1.57	0.49	0.70	0.00	0.00
3.60	1.90	1.93	0.27	0.46	1.88	#NULL!	1.82	0.30	0.44	0.00	0.00
3.00	1.87	2.08	0.72	1.39	1.87	#NULL!	1.88	0.57	0.74	0.00	0.00
7.30	1.91	1.83	0.58	0.88	1.91	#NULL!	1.83	0.55	0.74	0.00	0.00
6.90	1.25	1.37	0.61	1.08	0.91	#NULL!	1.82	0.68	1.13	0.00	0.00
3.50	1.58	1.47	0.25	0.47	1.61	#NULL!	1.60	0.32	0.50	0.00	0.00
4.40	2.77	2.97	0.57	1.02	2.65	#NULL!	2.72	0.53	0.55	0.00	0.00
5.80	0.79	0.82	0.15	0.28	0.84	#NULL!	0.92	0.32	0.43	0.00	0.00
2.60	3.24	2.78	0.73	1.28	2.22	1.00	2.31	0.76	1.54	0.00	0.00
5.60	1.21	1.24	0.37	0.62	1.25	#NULL!	1.42	0.41	0.63	0.00	0.00
6.20	1.77	1.48	0.59	1.03	1.47	#NULL!	1.39	0.50	0.71	0.00	0.00
4.30	1.65	1.81	0.35	0.64	1.53	#NULL!	1.60	0.52	1.00	0.00	0.00
6.00	1.61	1.55	0.33	0.61	1.65	#NULL!	1.65	0.39	0.73	0.00	0.00
4.40	1.47	1.39	0.31	0.53	1.30	#NULL!	1.39	0.47	0.76	0.00	0.00
3.80	1.64	1.49	0.56	1.08	1.86	#NULL!	1.76	0.60	0.70	0.00	0.00
5.20	1.96	2.05	0.36	0.69	2.17	#NULL!	2.24	0.45	0.66	0.00	0.00
3.90	3.74	3.68	0.69	1.32	2.91	#NULL!	3.08	0.86	1.14	0.00	0.00
5.90	1.99	2.02	0.45	0.83	1.73	#NULL!	1.62	0.62	0.92	0.00	0.00
5.90	1.13	1.16	0.31	0.50	1.14	#NULL!	1.27	0.43	0.60	0.00	0.00
5.20	3.15	2.81	1.03	1.92	1.87	#NULL!	2.35	0.98	1.89	0.00	0.00
3.20	2.06	2.11	0.47	0.82	2.06	#NULL!	2.08	0.50	0.47	0.00	0.00
3.30	1.74	1.72	0.17	0.29	2.00	#NULL!	2.20	0.66	0.84	0.00	0.00
5.40	2.02	1.56	0.79	1.47	1.24	#NULL!	1.43	0.71	1.25	0.00	0.00
4.30	3.34	3.51	0.72	0.85	3.65	#NULL!	3.55	0.65	1.04	0.00	0.00
4.70	1.28	1.37	0.19	0.35	1.36	#NULL!	1.44	0.45	0.44	0.00	0.00
5.00	1.15	1.16	0.32	0.52	1.50	#NULL!	1.84	0.90	1.63	0.00	0.00
4.60	1.55	1.57	0.51	0.85	1.65	#NULL!	1.69	0.58	0.94	0.00	0.00
6.80	2.29	2.27	0.70	1.11	2.17	#NULL!	1.96	0.75	1.01	0.00	0.00
6.50	1.50	1.71	0.47	0.90	2.08	#NULL!	2.03	0.70	0.90	0.00	0.00
5.10	0.82	0.95	0.47	0.65	1.11	#NULL!	1.40	0.89	0.93	0.00	0.00
4.60	2.15	2.06	0.75	1.13	2.34	#NULL!	2.25	0.82	0.74	0.00	0.00
5.50	2.07	2.06	0.51	1.01	1.88	#NULL!	1.81	0.76	1.41	0.00	0.00

noofattempt	bxdate	prebxsbp	prebxdbp	bloodproduct	nopieces	postSBP	PostDBP	majorcomplication	PGS	Cvascular
10.00	04-Oct-2013	118.00	80.00	0.00	3.00	120.00	80.00	0.00	0.00	2
10.00	##########	120.00	80.00	0.00	2.00	120.00	80.00	0.00	0.00	2
10.00	21-Jan-2014	110.00	80.00	0.00	3.00	110.00	80.00	0.00	0.00	1
10.00	##########	130.00	80.00	0.00	2.00	130.00	80.00	0.00	0.00	1
10.00	##########	130.00	80.00	0.00	2.00	140.00	90.00	0.00	0.00	1
10.00	21-Oct-2013	125.00	72.00	0.00	2.00	130.00	80.00	0.00	0.00	2
10.00	##########	130.00	80.00	0.00	2.00	130.00	80.00	0.00	#NULL!	2
10.00	06-Jan-2014	130.00	90.00	0.00	3.00	130.00	90.00	0.00	0.00	2
11.00	##########	130.00	80.00	0.00	2.00	130.00	80.00	0.00	0.00	1
11.00	##########	140.00	90.00	0.00	2.00	140.00	90.00	0.00	0.00	2
10.00	##########	150.00	80.00	0.00	2.00	140.00	90.00	0.00	14.20	2
10.00	03-Oct-2013	100.00	80.00	0.00	2.00	100.00	80.00	0.00	9.00	0
10.00	##########	130.00	80.00	0.00	2.00	130.00	80.00	0.00	0.00	2
10.00	##########	130.00	90.00	0.00	2.00	135.00	90.00	0.00	9.00	2
10.00	##########	140.00	88.00	0.00	3.00	140.00	88.00	0.00	0.00	0
10.00	14-Jan-2014	110.00	80.00	0.00	3.00	110.00	80.00	0.00	0.00	1
10.00	23-Oct-2013	110.00	80.00	0.00	3.00	110.00	80.00	0.00	16.00	1
10.00	##########	110.00	80.00	0.00	2.00	110.00	80.00	0.00	0.00	2
10.00	##########	130.00	80.00	0.00	2.00	140.00	90.00	0.00	0.00	1
10.00	##########	130.00	80.00	0.00	2.00	130.00	80.00	0.00	3.80	0
10.00	14-Oct-2013	120.00	80.00	0.00	3.00	130.00	80.00	0.00	33.00	2
10.00	14-Jan-2014	140.00	80.00	0.00	2.00	140.00	90.00	0.00	48.00	1
6.00	##########	130.00	80.00	0.00	2.00	150.00	90.00	0.00	0.00	2
10.00	##########	130.00	80.00	0.00	2.00	140.00	90.00	0.00	66.60	2
10.00	##########	120.00	80.00	0.00	3.00	120.00	80.00	0.00	8.30	2
11.00	##########	120.00	80.00	0.00	2.00	130.00	80.00	0.00	6.25	2
10.00	##########	130.00	90.00	0.00	2.00	130.00	90.00	0.00	30.00	2
10.00	17-Oct-2013	120.00	80.00	0.00	3.00	120.00	80.00	0.00	0.00	0
11.00	##########	130.00	80.00	0.00	3.00	130.00	80.00	0.00	0.00	2
10.00	28-Oct-2013	130.00	80.00	0.00	3.00	140.00	90.00	0.00	11.00	2
10.00	##########	130.00	80.00	0.00	3.00	140.00	90.00	0.00	69.20	2
10.00	##########	102.00	72.00	0.00	2.00	102.00	72.00	0.00	0.00	2
10.00	##########	130.00	80.00	0.00	2.00	140.00	80.00	0.00	0.00	1
10.00	##########	130.00	90.00	0.00	3.00	130.00	90.00	0.00	66.60	2
10.00	##########	130.00	80.00	0.00	2.00	130.00	90.00	0.00	0.00	2

10.00	##########	140.00	90.00	0.00	2.00	140.00	90.00	0.00	25.00	2
10.00	23-Oct-2013	130.00	90.00	0.00	3.00	130.00	90.00	0.00	11.00	1
10.00	##########	130.00	80.00	0.00	3.00	140.00	80.00	0.00	0.00	1
10.00	##########	140.00	90.00	0.00	2.00	130.00	80.00	0.00	100.00	2
10.00	10-Oct-2013	110.00	80.00	0.00	2.00	110.00	80.00	0.00	0.00	1
10.00	14-Oct-2013	130.00	80.00	0.00	3.00	140.00	90.00	0.00	50.00	2
10.00	##########	130.00	80.00	0.00	2.00	130.00	80.00	0.00	0.00	0
10.00	##########	140.00	90.00	0.00	2.00	140.00	90.00	0.00	50.00	2
10.00	##########	140.00	90.00	0.00	2.00	140.00	90.00	0.00	24.13	2
10.00	##########	130.00	90.00	0.00	2.00	130.00	80.00	0.00	11.00	0
10.00	02-Oct-2013	110.00	80.00	0.00	2.00	120.00	80.00	0.00	12.50	2
11.00	##########	135.00	89.00	0.00	2.00	140.00	90.00	0.00	0.00	2
10.00	##########	130.00	80.00	0.00	3.00	130.00	80.00	0.00	9.00	2
10.00	##########	150.00	90.00	0.00	2.00	140.00	90.00	0.00	37.50	2
10.00	##########	150.00	99.00	0.00	2.00	150.00	90.00	0.00	0.00	1
10.00	16-Jan-2014	130.00	90.00	0.00	2.00	130.00	90.00	0.00	30.70	1
10.00	##########	130.00	80.00	0.00	2.00	130.00	80.00	0.00	0.00	0
10.00	##########	133.00	95.00	0.00	3.00	130.00	90.00	0.00	8.30	2
10.00	##########	130.00	80.00	0.00	2.00	130.00	80.00	0.00	50.00	2
11.00	##########	130.00	80.00	0.00	2.00	120.00	80.00	0.00	0.00	0
10.00	10-Jan-2014	112.00	80.00	0.00	2.00	112.00	80.00	0.00	0.00	0
10.00	##########	130.00	80.00	0.00	2.00	140.00	80.00	0.00	0.00	2
10.00	10-Feb-2013	125.00	80.00	0.00	2.00	130.00	80.00	0.00	12.50	2
10.00	##########	130.00	80.00	0.00	2.00	140.00	90.00	0.00	0.00	0
10.00	##########	118.00	81.00	0.00	3.00	130.00	85.00	0.00	0.00	1
10.00	02-Oct-2013	140.00	85.00	0.00	2.00	150.00	90.00	0.00	77.70	2
10.00	14-Jan-2014	140.00	90.00	0.00	2.00	140.00	90.00	0.00	85.71	2
10.00	##########	130.00	80.00	0.00	2.00	140.00	80.00	0.00	25.00	2
10.00	##########	140.00	80.00	0.00	2.00	140.00	80.00	0.00	0.00	2
10.00	##########	130.00	80.00	1.00	2.00	130.00	90.00	0.00	50.00	2
10.00	21-Oct-2013	100.00	70.00	0.00	2.00	110.00	80.00	0.00	0.00	2
10.00	##########	140.00	90.00	0.00	2.00	140.00	90.00	0.00	66.66	2
10.00	##########	130.00	80.00	0.00	2.00	150.00	90.00	0.00	10.00	2
10.00	09-Oct-2013	160.00	90.00	0.00	2.00	140.00	90.00	0.00	60.00	2
10.00	21-Oct-2013	112.00	80.00	0.00	2.00	10.00	80.00	0.00	44.40	2
10.00	##########	130.00	80.00	0.00	3.00	140.00	80.00	0.00	64.20	2

10.00	##########	130.00	80.00	0.00	2.00	130.00	80.00	0.00	33.30	2
10.00	##########	140.00	90.00	0.00	3.00	140.00	90.00	0.00	60.00	2
10.00	##########	140.00	90.00	0.00	2.00	140.00	90.00	0.00	63.60	2
11.00	##########	150.00	90.00	0.00	2.00	150.00	90.00	0.00	25.00	2
11.00	##########	140.00	90.00	0.00	2.00	130.00	90.00	0.00	0.00	2
10.00	##########	140.00	90.00	0.00	3.00	140.00	90.00	0.00	60.00	1
10.00	24-Oct-2013	130.00	90.00	0.00	3.00	130.00	90.00	0.00	33.30	1
10.00	15-Jan-2014	140.00	90.00	0.00	2.00	140.00	90.00	0.00	93.30	2
10.00	##########	150.00	90.00	0.00	2.00	150.00	90.00	0.00	100.00	2
10.00	14-Jan-2014	110.00	80.00	0.00	3.00	110.00	80.00	0.00	0.00	1
10.00	10-Oct-2013	140.00	90.00	0.00	2.00	140.00	90.00	0.00	84.60	2
10.00	##########	140.00	80.00	0.00	2.00	150.00	90.00	0.00	50.00	2
10.00	10-Oct-2013	140.00	90.00	0.00	2.00	140.00	90.00	0.00	21.40	2
10.00	01-Oct-2013	140.00	80.00	0.00	2.00	140.00	90.00	0.00	20.00	2
11.00	##########	130.00	90.00	0.00	2.00	135.00	90.00	0.00	90.00	2
10.00	21-Oct-2013	105.00	65.00	0.00	3.00	110.00	80.00	0.00	0.00	2
10.00	##########	130.00	80.00	0.00	2.00	140.00	80.00	0.00	20.00	1
10.00	##########	140.00	80.00	0.00	2.00	150.00	90.00	0.00	82.60	2
10.00	##########	130.00	80.00	0.00	2.00	150.00	93.00	0.00	0.00	2
10.00	22-Jan-2014	140.00	90.00	0.00	3.00	140.00	90.00	0.00	30.00	2
11.00	##########	140.00	90.00	0.00	2.00	150.00	90.00	0.00	#NULL!	2
10.00	##########	140.00	90.00	0.00	2.00	140.00	90.00	0.00	#NULL!	2
10.00	03-Jan-2014	140.00	90.00	0.00	3.00	140.00	90.00	0.00	33.33	2
10.00	##########	140.00	80.00	0.00	3.00	140.00	90.00	0.00	37.50	2
11.00	##########	130.00	80.00	0.00	3.00	135.00	80.00	0.00	14.20	2
10.00	14-Jan-2014	140.00	90.00	0.00	3.00	140.00	90.00	0.00	81.80	2
10.00	##########	140.00	90.00	0.00	2.00	140.00	90.00	0.00	68.75	2
10.00	15-Jan-2014	100.00	70.00	0.00	2.00	110.00	80.00	2.00	42.80	1
10.00	##########	140.00	80.00	0.00	2.00	140.00	90.00	0.00	75.00	2
10.00	02-Oct-2013	138.00	102.00	0.00	2.00	130.00	80.00	0.00	0.00	2
10.00	##########	130.00	80.00	0.00	3.00	140.00	80.00	0.00	62.50	2
10.00	16-Jan-2014	144.00	100.00	0.00	2.00	144.00	90.00	0.00	36.30	2
10.00	02-Oct-2013	125.00	84.00	0.00	2.00	130.00	90.00	0.00	8.30	2

Ctubular	Cinterstitial	CIF	CIFIGG	CIFIGA	CIFIGM	CIFC3	CIFC4	CIFCIQ	CIFI	CIFLC
0		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0		0	1.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00
0		0	1.00	2.00	1.00	2.00	3.00	1.00	2.00	1.00
0		0	1.00	3.00	0.00	1.00	2.00	2.00	2.00	0.00
0		0	1.00	0.00	2.00	0.00	1.00	0.00	0.00	0.00
0		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0		0	1.00	3.00	0.00	0.00	2.00	0.00	0.00	0.00
0		0	1.00	3.00	0.00	0.00	2.00	0.00	0.00	0.00
0		0	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
0		0	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
0		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0		0	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
0		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0		0	1.00	3.00	0.00	1.00	2.00	0.00	0.00	0.00
0		0	1.00	2.00	0.00	0.00	2.00	0.00	2.00	0.00
0		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0		0	1.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00
1		1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
0		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0		0	1.00	0.00	3.00	0.00	2.00	0.00	0.00	0.00
1		1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
1		1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2		2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0		0	1.00	3.00	0.00	0.00	1.00	0.00	0.00	0.00
0		0	1.00	3.00	0.00	0.00	2.00	0.00	0.00	0.00
0		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2		2	1.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00
1		1	1.00	3.00	2.00	2.00	1.00	0.00	1.00	0.00
2		2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1		1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0		0	1.00	3.00	0.00	0.00	2.00	0.00	0.00	0.00
1		0	1.00	3.00	3.00	0.00	3.00	3.00	0.00	0.00
1		1	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00
1		1	1.00	3.00	2.00	1.00	3.00	0.00	0.00	0.00

1	1	1.00	0.00	3.00	0.00	2.00	0.00	0.00	0.00	0.00
1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	1	1.00	0.00	2.00	0.00	2.00	0.00	0.00	0.00	0.00
1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	1	1.00	3.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00
2	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	1.00	2.00	3.00	2.00	3.00	3.00	2.00	0.00	0.00
1	1	1.00	0.00	2.00	0.00	2.00	0.00	0.00	0.00	0.00
1	1	1.00	2.00	2.00	2.00	2.00	2.00	2.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	1.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00
1	1	1.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	1.00	3.00	2.00	1.00	3.00	2.00	2.00	0.00	0.00
1	1	1.00	0.00	3.00	0.00	2.00	0.00	0.00	0.00	0.00
1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	1	1.00	3.00	2.00	1.00	1.00	1.00	2.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	1	1.00	3.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	2	1.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
2	2	1.00	0.00	2.00	0.00	2.00	0.00	0.00	0.00	0.00
2	2	1.00	3.00	0.00	2.00	3.00	2.00	0.00	0.00	0.00
2	2	1.00	0.00	3.00	0.00	3.00	0.00	0.00	0.00	0.00
0	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	1	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
2	2	1.00	0.00	3.00	0.00	2.00	0.00	0.00	0.00	0.00
2	2	1.00	3.00	0.00	2.00	2.00	1.00	1.00	0.00	0.00
1	2	1.00	0.00	2.00	1.00	1.00	0.00	0.00	0.00	0.00

2	2	1.00	2.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00
2	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	2	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	2	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00
2	2	1.00	2.00	3.00	0.00	2.00	0.00	0.00	0.00	0.00
2	2	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	1	0.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00	0.00
2	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	1	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00
1	1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
2	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	2	1.00	3.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00
1	1	1.00	0.00	0.00	2.00	2.00	0.00	0.00	0.00	0.00
2	2	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00
1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	2	1.00	0.00	2.00	1.00	1.00	0.00	0.00	0.00	0.00
2	2	1.00	0.00	3.00	0.00	2.00	0.00	0.00	0.00	0.00
2	2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
2	2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
2	2	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00
2	2	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
2	2	1.00	0.00	3.00	0.00	2.00	0.00	0.00	0.00	0.00
2	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	2	1.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00
2	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	1	1.00	0.00	3.00	0.00	2.00	0.00	0.00	0.00	0.00
2	2	1.00	0.00	3.00	2.00	2.00	0.00	1.00	0.00	0.00

tubularatrophy	TA	TASCO	IFSCO	fibroscoring	CEM	biopsyreport
0.00	0.00	0.00	20.00	0.00	0.00	Membrnaous nephropathy
0.00	0.00	0.00	15.00	0.00	0.00	Mesangio proliferative GN
0.00	0.00	0.00	15.00	0.00	0.00	Diffuse proliferative IgA with FSGS
0.00	0.00	0.00	5.00	0.00	0.00	CLASS IV LN
0.00	0.00	0.00	15.00	0.00	0.00	PROLIFERATIVE GN WITH HYALINE THROMBI
0.00	0.00	0.00	10.00	0.00	0.00	diffuse proliferative ig A gn with focal mesangial s
0.00	0.00	0.00	15.00	0.00	0.00	Arteriolonephrosclerosis with focal ischemic glom
0.00	0.00	0.00	20.00	0.00	0.00	Membrnous nephropathy
0.00	0.00	0.00	5.00	0.00	0.00	MEMBRANOUS NEPHROPATHY
0.00	0.00	0.00	5.00	0.00	0.00	ARTERIOLONEPHROSCLEROSIS
0.00	0.00	0.00	10.00	0.00	0.00	ARTERIOLONEPHROSCLEROSIS
0.00	0.00	0.00	15.00	0.00	0.00	MESANGIOPROLIFEARTIVE GLOMERULONEP
0.00	0.00	0.00	15.00	0.00	0.00	MESPGN
0.00	0.00	0.00	15.00	0.00	0.00	dIFFUSE PREDOMINANATLY MES PGN
0.00	0.00	0.00	15.00	0.00	0.00	DPGN
0.00	0.00	0.00	5.00	0.00	0.00	Membranous Nephropathy
0.00	0.00	0.00	5.00	0.00	0.00	Mesangioproliferative GN
0.00	0.00	0.00	10.00	0.00	0.00	MEMBRANOUS NEPHROPATHY
0.00	0.00	0.00	20.00	0.00	0.00	FOCAL AND SEGMENTAL PROLIFERATIVE GL
0.00	0.00	0.00	35.00	1.00	0.00	MESANGIAL PROLIFERATIVE GN
0.00	0.00	0.00	25.00	1.00	0.00	Mesangial Ig A nephropathy with FSGS
0.00	0.00	0.00	25.00	1.00	0.00	focal segmental glomerulosclerosis
1.00	1.00	1.00	45.00	1.00	0.00	FOCAL SEG PROLI GN WITH INCIPIENT NECR
1.00	1.00	1.00	45.00	1.00	0.00	ARETIONEPHROSCLEROSI WITH CIN
0.00	1.00	1.00	35.00	1.00	0.00	Membranous nephropathy
0.00	0.00	0.00	35.00	1.00	0.00	dIFFUSE INTERCAPILLARY GS WITH CONCOM
1.00	1.00	1.00	30.00	1.00	0.00	Chronic interstitial nephritis
1.00	1.00	1.00	40.00	1.00	0.00	DIFFUSE PROLIFERATIVE GLOMERULONEPH
1.00	1.00	1.00	50.00	1.00	0.00	CLASS V LN
0.00	0.00	0.00	25.00	1.00	1.00	Arterionephr osclerosis with ischemic atrophy with
1.00	1.00	1.00	40.00	1.00	0.00	CIN WITH DIFFUSE GLOBAL GLOMERULOSCL
1.00	1.00	1.00	30.00	1.00	0.00	CLASS II LN
1.00	1.00	1.00	35.00	1.00	0.00	DPGN
1.00	1.00	1.00	30.00	1.00	0.00	Arteriolonephrosclerosis with fsgs
1.00	1.00	1.00	45.00	1.00	0.00	dpgn WITH CAP THICKENING CLASS IV LN

1.00	1.00	1.00	40.00	1.00	0.00	PROLIFERATIVVE IGA WITH FSGS
0.00	0.00	0.00	25.00	1.00	0.00	Diffuse intercapillary diabetic glomerulosclerosis
1.00	1.00	1.00	40.00	1.00	0.00	MESANGIAL IGA NEPHROPATHY WITH FSGS
1.00	1.00	1.00	35.00	1.00	0.00	ARTERIONEPHROSCLEROSIS
1.00	1.00	1.00	35.00	1.00	0.00	MEMBRANOUS NEPHROPATHY
1.00	1.00	1.00	45.00	1.00	0.00	CHRONIC INTERSTITIAL NEPHRITIS WITH CO
0.00	0.00	0.00	25.00	1.00	0.00	LN IV
1.00	1.00	1.00	45.00	1.00	0.00	mesangio proliferative igA
1.00	1.00	1.00	30.00	1.00	0.00	MPGN class IV LUPUS NEPHRITIS
0.00	1.00	1.00	25.00	1.00	0.00	SLE class IV LN
1.00	1.00	1.00	30.00	1.00	0.00	Mesangial Ig A with arterionephrosclerosis
1.00	1.00	1.00	45.00	1.00	0.00	mES PGN WITH FSGS
1.00	1.00	1.00	35.00	1.00	0.00	Primary amyloidosis
1.00	1.00	1.00	35.00	1.00	0.00	MESANGIOPROLIFERATIVE IGA GN
1.00	1.00	1.00	50.00	1.00	0.00	Diffuse proliferative glomerulonephritis with focal c
1.00	1.00	1.00	50.00	1.00	0.00	Diffuse proliferative IgA GN with seg sclerosis
1.00	1.00	1.00	35.00	1.00	0.00	MILD MESANGIAL HYPERCELLULARITY
1.00	1.00	1.00	40.00	1.00	0.00	MEMBRANOUS NEPHROPATHY WITH FOCI OI
1.00	1.00	2.00	45.00	1.00	0.00	dIFFUSE INTERCAPILLARY AND NODUALR GL
1.00	1.00	1.00	40.00	1.00	0.00	MEMBRANOSU WITH FSGS
1.00	1.00	1.00	30.00	1.00	0.00	diffuse predominantly mesangial proliferative GN
1.00	1.00	1.00	35.00	1.00	0.00	ARTERIONEPHROSCLEROSIS WITH GLOMER
1.00	1.00	1.00	40.00	1.00	0.00	Menbranous Nephropathy
0.00	0.00	0.00	25.00	1.00	0.00	FOCAL SEGMENTAL PROLIFERATIVE GN WIT
2.00	1.00	2.00	65.00	2.00	0.00	Mesangioproliferative proliferative glomerulonephı
2.00	1.00	2.00	75.00	2.00	0.00	chronic sclerosing Ig A glomerulonephritis
2.00	1.00	3.00	80.00	2.00	0.00	chronic sclerosing IgA GN with ATN
2.00	1.00	2.00	65.00	2.00	0.00	PROLIFERATIVE GN WITH DIF
2.00	1.00	2.00	65.00	2.00	0.00	dpgnIGA WITH FOCAL INCIPINET NECROSIS
2.00	1.00	2.00	55.00	2.00	0.00	Hypertensive arteriolosclerosis with chronic interst
2.00	1.00	2.00	80.00	2.00	0.00	Acute on chronic tubulointerstitial nephritis with tul
2.00	1.00	3.00	80.00	2.00	0.00	Diffuse intercapillary glomerulosclerosis with CIN
2.00	1.00	2.00	72.00	2.00	0.00	ARTERIONEPHROSCLEROSIS WITH FSGS WI
2.00	1.00	2.00	60.00	2.00	0.00	Mesangial proliferative ig A Gn with segmental scl
2.00	1.00	2.00	65.00	2.00	0.00	MEMBRANOUS NEPHROPATHY
2.00	1.00	2.00	65.00	2.00	1.00	DPAND SCLEROSING GN

2.00	1.00	2.00	75.00	2.00	0.00	DPGN FOCI OF MESANGIAL SCLEROSIS
2.00	1.00	2.00	65.00	2.00	0.00	ARTERIONEPHROSCLEROSIS WITH TUBULOI
2.00	1.00	2.00	75.00	2.00	0.00	Diffuse intercapillary and focal nodular diabetic glo
2.00	1.00	2.00	65.00	2.00	0.00	Arterionephrosclerosis with focal glomerular atrop
2.00	1.00	2.00	65.00	2.00	0.00	aRTERIONEPHROSCLEROSIS
2.00	1.00	3.00	80.00	2.00	0.00	Diffuse intercapillary and focal nodular glomerulos
2.00	1.00	2.00	60.00	2.00	0.00	Mes proliferative Ig A GN with FSGS
2.00	1.00	2.00	75.00	2.00	0.00	Diabetic Nephropathy with CIN
2.00	1.00	2.00	65.00	2.00	0.00	ARTERIONEPHROSCLEROSIS
2.00	1.00	2.00	55.00	2.00	0.00	class iv lupus nephritis
2.00	1.00	2.00	55.00	2.00	0.00	ARTERIOLONEPHROSCLEROSIS WITH FOCAI
2.00	1.00	2.00	55.00	2.00	0.00	FSGS WITH ARTERIONEPHROSCLEROSIS
2.00	1.00	2.00	75.00	2.00	0.00	ARTERIONEPHROSCLEROSIS WITH FSGS AN
2.00	1.00	2.00	65.00	2.00	0.00	chronic interstitial nephritis
2.00	1.00	2.00	55.00	2.00	0.00	ARTERIONEPHROSCLEROSIS WITH SEC FSG
2.00	1.00	2.00	60.00	2.00	0.00	DIFFUSE INTERCAPILLARY GLOMERULOSCLE
2.00	1.00	2.00	65.00	2.00	0.00	PROLIFERATIVE GN AND SEGMENTAL GLOM
2.00	1.00	3.00	90.00	2.00	0.00	DIFFUSE GLOBAL SCLEROSIS
2.00	1.00	2.00	65.00	2.00	0.00	ARTERIONEPHROSCLEROSIS WITH CIN
2.00	1.00	3.00	80.00	2.00	0.00	roliferarive sclerosisng GN with a FSGS with ATN
1.00	1.00	1.00	65.00	2.00	0.00	Arterionephrosclerosis with focal tubular necrosis.
2.00	1.00	2.00	60.00	2.00	0.00	Proliferative Ig A Gn with segments sclerpsis and
2.00	1.00	2.00	75.00	2.00	0.00	proliferative and sclerosing Ig A
2.00	1.00	2.00	75.00	2.00	0.00	ARETIONEPHROSCLEROSIS WITH TUBULAR
2.00	1.00	2.00	75.00	2.00	1.00	MESANGIOPROLIFERATIVE GN WITH ACUTE
2.00	1.00	2.00	70.00	2.00	0.00	arterionephrosclerosis
2.00	1.00	2.00	75.00	2.00	0.00	FSGS with ATN
2.00	1.00	2.00	60.00	2.00	0.00	Proliferative and sclerosing Ig A glomeruloneprhiti
2.00	1.00	3.00	85.00	2.00	0.00	nODULAR DIABETIC GLOMERULOSCLEROSIS
2.00	1.00	2.00	60.00	2.00	0.00	DIFFUSE PROLIFRERATIVE GLOMERULONEP
2.00	1.00	2.00	72.00	2.00	0.00	dIFFUSE IN FIBROSIS WITH TUBULAR ATROP
2.00	1.00	2.00	70.00	2.00	0.00	proliferative gN with seg sclerosis with cellular to f
2.00	1.00	2.00	70.00	2.00	0.00	diffuse proliferative IgA

CGlomer	finaldiagnosis	agegroup	Stage2	FS	symphtn	depth2	
0/4 uniform thickening of capillary walls with pronr	MN	46-55	1.00	0.00	0	1	
0/9 mesnagial exp and mes proliferation	PGN	26-35	1.00	0.00	0	1	
0/16 fsgs with mes matrix exp with endo cap prol	IGA	15-25	1.00	0.00	0	1	
0/16 ENDOCAPILLARY PROLIFERATION	LN	15-25	1.00	1.00	1	1	
0/12 PROLIFERATIVE GN WITH HYALINE THR(	LN	26-35	1.00	1.00	0	1	
0/14 mild mes expa with mes cellularity with endo(	IGA	15-25	1.00	1.00	0	1	
secondary FSGS	Hypertensive Nephrosclerosis	56-65	1.00	0.00	1	0	
0/16 mild mesangial thick and prolif thickening of	MN	56-65	2.00	0.00	0	1	
0/11 UNIFORM CAPILLARY THICKENING	MN	15-25	1.00	1.00	1	0	
0/10 MESAN EXPAN HYPERCELLULARITY	Hypertensive Nephrosclerosis	26-35	2.00	1.00	1	0	
1/7 INTERCAPILLARY MES EXPAN	Hypertensive Nephrosclerosis	46-55	2.00	1.00	1	1	
2/21 VAR INCREASE IN MES CELLULARITY	PGN	15-25	1.00	0.00	0	1	
0/7 MESANGIAL PROLIFERATION with variable	PGN	15-25	1.00	1.00	1	1	
1/11 MILD MESANG CELLULARITY ENDOCAPI	PGN	56-65	2.00	1.00	0	1	
0/6 ENDOCAPILLARY PROLIFERATION CAPILL	PGN	56-65	1.00	1.00	1	0	
0/9mesangial matrix exp and cellularity	MN	15-25	1.00	0.00	0	1	
1/6 globally sclerosed	PGN	36-45	1.00	1.00	0	0	
0/14 MILD MES EXPAN WITH CAPILLLARY WA	MN	46-55	1.00	1.00	0	1	
0/5 enlarged tufts with matrix expansion	PGN	15-25	1.00	1.00	0	0	
1/26 MESANGIAL EXPANSION WITH HYPERCE	PGN	15-25	1.00	1.00	0	1	
1/3 globally sclerosed mes expan with fsgs	IGA	36-45	2.00	0.00	1	1	
2/5 global sclerosis with mesangial hypercellulari	FSGS	46-55	2.00	0.00	1	1	
0/11 MES EXPAN AND CELLULARITY INCIPIEN	VASCULITIS	26-35	1.00	1.00	1	1	
2/3 SCLEROSED REST DIFF INTERCAP EXPAN	CIN	26-35	2.00	1.00	1	1	
1/12 globally sclerosed with uniform thick of cap	MN	36-45	1.00	0.00	0	1	
1/16 SLCEROSED INTERCAP MATRIX EX WITH	MN	56-65	1.00	1.00	1	0	
3/10 glom tuft atrophy with mesangial matrix expa	CIN	15-25	1.00	1.00	1	1	
0/11 ENDOCAPILLARY PROLIFERATION WITH	PGN	15-25	2.00	1.00	1	1	
0/12 CAPILLARY WALL THICKENING	LN	46-55	1.00	1.00	0	0	
1/9sclerosed3 show ischemic atrophy intercapme	Hypertensive Nephrosclerosis	56-65	2.00	1.00	1	1	
9/13 SCLEROSED WITH MESANGIAL EXPANSI	CIN	46-55	2.00	1.00	0	1	
0/12 DIF MES PROLIFERATION	LN	36-45	1.00	1.00	0	0	
0/5 MESANGIAL MATRIX EXPANSION	PGN	15-25	1.00	1.00	0	1	
2/3 globally sclerosed mes exp amd mes cell	FSGS	46-55	1.00	1.00	1	1	
0/22 ENLARGED ENDOCAP PROLI with mesang	LN	15-25	2.00	1.00	1	1	

1/4 INCREASE MESANGIAL CELLULARITY WIT	IGA	26-35	2.00	1.00	1	1
1/9 glon\bally sclerosed with remaining mes expar	DN	36-45	1.00	1.00	1	1
0/8 MESANGIAL HYPERCELLULARITY WITH FS	IGA	46-55	1.00	1.00	1	0
3/3 GLOBALLY SCLEROSED GLOMERULI	Hypertensive Nephrosclerosis	26-35	2.00	1.00	1	1
0/19 VARIABLE INCREASE IN MES CELLULARI	MN	36-45	1.00	1.00	0	1
5/10 GLOBALLY SCLEROSED REST INTERCAF	CIN	46-55	2.00	1.00	1	1
0/6DIF ENDOCAPILLARY WITH CAP WALL THI	LN	15-25	1.00	0.00	0	0
1/2 glomeruli sclerosed 1 mesan exp with incre ce	IGA	36-45	2.00	1.00	1	1
7/29 sclerosed accentuation of lobulation	LN	56-65	1.00	1.00	1	1
1/9 globally sclerosed diffuse proliferation	LN	15-25	1.00	0.00	1	0
1/8 mesangial expansion with prominence of endo	IGA	36-45	2.00	1.00	1	0
0/5 MES EXPAN INCRE CELLULARITY fsgs	PGN	36-45	1.00	1.00	1	1
1/11 globally sclerosed with rest showing amorph	Primary amyloidosis	66-75	2.00	1.00	1	1
3/8 MES PROLIFERATIVE GN SEGMENTAL SC	IGA	26-35	2.00	1.00	1	1
0/12 endocapillary cell proliferation with neutrophil	PGN	26-35	2.00	1.00	0	0
4/13 globally sclerosed mes and eno proliferation	IGA	36-45	2.00	1.00	1	1
0/10 MILD MESANGIAL EX WITH VARIA HYPER	PGN	15-25	1.00	1.00	1	1
1/12 UNIFORM CAPILLARY WALL THICKENING	MN	46-55	1.00	1.00	1	0
1/2 SCLEROSED REST INTERCAPILLARY DIFF	DN	46-55	1.00	1.00	0	0
0/13MILD MESANG HYPERCELLULARITY WITH	MN	36-45	1.00	1.00	0	1
0/11 mes expansion and mes hypercellularity with	PGN	26-35	2.00	1.00	1	1
0/8 INTERCAPILLARY MATRIX EXPANSION	Hypertensive Nephrosclerosis	36-45	2.00	1.00	1	1
1/8 uniform capillary wall thickening with narrowin	MN	56-65	2.00	1.00	1	1
0/15 FOCAL SEGMENTAL PROLIFERATIVE GN	PGN	15-25	1.00	1.00	0	0
0/5 matrix mesangial expansion with mesangial h	PGN	36-45	2.00	1.00	1	1
7/9 global glomerulosclerosis with cap synechia	IGA	15-25	2.00	1.00	1	1
6/7 sclerosed endocapillary prominance with scler	IGA	26-35	2.00	1.00	1	1
2/8 SCLEROSED MES EXAP AND PROMINANC	PGN	15-25	2.00	1.00	1	0
0/16CIICUMFERENTIAL CELLULAR CRESCENT	IGA	15-25	2.00	1.00	1	1
3/6 glomerulosclerosiss	Hypertensive Nephrosclerosis	36-45	2.00	1.00	1	0
0/8 mild mes expan prominence of endocapillary	CIN	36-45	2.00	1.00	0	1
4/6 globally sclerosed with intercapillary scleros	DN	56-65	2.00	1.00	1	1
1/10 SCLEROSED ENDO CAP PROLI AMD MES	PGN	56-65	2.00	1.00	1	1
6/10 globally sclerosed remain mesangial sclerosi	IGA	36-45	2.00	1.00	1	0
4/9 GLOBALLY SCLEROSED PROM ENDOCAPI	MN	46-55	1.00	1.00	0	1
9/14 are sclerosed mes expansion and endocap p	PGN	26-35	2.00	1.00	1	1

2/6 SCLEROSED MESAN EXP AND ENDO CAPI	LN	36-45	2.00	1.00	1	0
6/10 INTERCAPILLARY MATRIX EXPANSION	Hypertensive Nephrosclerosis	26-35	2.00	1.00	1	0
7/11globally sclerosed dif mes exp endocapillary c	DN	36-45	2.00	1.00	1	1
3/12 globally sclerosed MES EXPAN INCRE CELI	Hypertensive Nephrosclerosis	36-45	2.00	1.00	1	1
0/4 INTERCAPILLARY MESANGIAL EXPANSION	Hypertensive Nephrosclerosis	36-45	2.00	1.00	0	0
3/5 globally sclerosed with nodular expansion inte	DN	56-65	2.00	1.00	1	1
1/3 sclerosedmes expan and proliferation	IGA	15-25	2.00	1.00	1	1
14/15 globally sclerosed with intercapillary scler	DN	46-55	2.00	1.00	1	1
1/1 GLOBAL SCELROSED	Hypertensive Nephrosclerosis	46-55	2.00	1.00	1	0
0/10 glomeruli with tuft accentuation and dif prol	LN	15-25	1.00	1.00	0	1
11/13 GLOBAL SCLEROSED REST FSGS	Hypertensive Nephrosclerosis	56-65	2.00	1.00	1	1
3/6 ARE SCLEROSED WITH REST SHOWING F	FSGS	46-55	2.00	1.00	1	0
3/14 FOAL AND SEGMENTAL SCLEROSIS WITI	Hypertensive Nephrosclerosis	36-45	2.00	1.00	1	1
1/5 intercapillary mesangial expansion	CIN	36-45	2.00	1.00	1	0
9/10 DIFFUSE GLOBAL SCLEROSIS	Hypertensive Nephrosclerosis	36-45	2.00	1.00	1	1
0/13 DIFFUSE MESAN EXPAN CAPILLARY WAI	DN	56-65	2.00	1.00	1	1
1/5 SCLEROSED WITH REST ENDOCAP PROL	PGN	36-45	2.00	1.00	0	1
19/23 GLOBALLLY SCLEROSED WITH REST SI	CGN	46-55	2.00	1.00	1	1
0/5 DIFFUSE INTERCAPILLARY MATRIX EXPAI	Hypertensive Nephrosclerosis	46-55	2.00	1.00	1	0
3/10 scle endo capi prolmesexp amd mes cellul e	FSGS	56-65	2.00	1.00	1	0
MES EXPAN WITH MILD INCREASE IN CELLUL	Hypertensive Nephrosclerosis	46-55	2.00	1.00	1	1
mesangio proliferative	IGA	36-45	2.00	1.00	1	1
2/6 sclerosed endo cap proliferation mes exp& ce	IGA	15-25	2.00	1.00	1	1
3/8 SCLEROSSED WITH REST FSGS	Hypertensive Nephrosclerosis	26-35	2.00	1.00	1	0
1/7 VARIABLE INCREASE IM MES CELLULARIT	PGN	15-25	2.00	1.00	1	1
9/11 globally sclerosed remain mes exp and	Hypertensive Nephrosclerosis	56-65	2.00	1.00	1	1
11/16sclerosed prom endocapillary cells with seg	FSGS	15-25	2.00	1.00	1	1
3/7 globally sclerosed remaining showing mes exp	IGA	46-55	2.00	1.00	1	1
6/8 GLOBALLY SCLEROSEDREST DIFFUSE IN	DN	46-55	2.00	1.00	1	0
0/8 INCREASED MESangial AND ENDOCAPILL	PGN	36-45	2.00	1.00	1	1
5/8 GLOBAL SCLEROSED WITH INCRE CELLU	CGN	26-35	2.00	1.00	1	1
4/11sclerosed mes expansion with proliferation	VASCULITIS	26-35	2.00	1.00	1	1
1/12 endocapillary prolif and mesangial matrix exp	IGA	36-45	2.00	1.00	1	1

depth1	depth3	depth4	depth5	dll1	dll2	dll3	dll4	dll5	FDL	FDR	stage3
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newFS	newfibrosissco	echo2	echo1
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1.00	2.00	1.00	1.00
1.00	2.00	0.00	1.00

Proforma

Serial number:
Hospital No:

1	Name		
2	Age		
3	Sex	M	F
4	Height		
5	Weight		
6	BMI		
7	eGFR(MDRD)		Stage:

Brief History

H/o Smoking /Drug abuse (NSAIDS)

Family H/o Renal disease/DM/HTN/Others

No. of Antihypertensives

Antiplatelet drugs : yes/No

7.Presenting Complaints:

	yes	NO	Duration(If YES)
1.Edema			
2.Hypertension			
3.Renal dysfunction			
4.Hematuria			

Comorbidities:

TYPE	YES	NO	Duration (If Yes)
DM			
HTN			
CAD			
Malignancy			
Prior Kidney disease			

Pre-biopsy Diagnosis:

Glomerulonephritis	Non Diabetic		Diabetic	
Interstitial Nephritis				
Others				

Non Diabetic Glomerulonephritis:

Prebiopsy Lab Parameters

Hemoglobin				
Platelet count				
PT with INR				
APTT				
Bleeding time				
HIV				
HBsAg				
HCV				
Urine analysis				
WBC				
RBC				
CASTS				
CRYSTALS				
Protein				
Blood				
24 Hr Urine Protien				
UP/UC				
Urea				
Creatinine				
Albumin				
Total protein				
Lipid profile	TC	TG	HDL	LDL
C3				
C4				
ANA				
Ds DNA				
ASO				
ADNB				
ANCA	CANCA		P ANCA	
Serum Electrophoresis				
κ:λ				

Past H/o use of immunosuppression (pred/CNIs/Endoxan/MMF)

Drug	YES	NO	Duration ofimmunosuppresion
Prednisolone			
CNIs			
Endoxan			
MMF			
Levamisole			

Details of previous biopsy

Glomerular compartment	
Interstitial compartment	
Tubular compartment	
Vascular compartment	
Immunofluroscence	
Electron Micrscopy	

Histo-pathological Diagnosis:

Pre biopsy

Ultrasound	Right Kidney	Left Kidney
Size		
Echogencity		
Parenchymal thickness		
ARFI scan		
Cysts		
Calculi		

Lower pole values values of ARFI:

Right Kidney	Left Kidney

Number of attempts :

Biopsy date:

Prebiopsy BP:

Prebiopsy medication (DDVAP)

Blood product infused (FFP/Platelets)

Radiologist :

Biopsy Done by:

Place of biopsy:

No. of Attempts:

Underguidance: yes no

No. of pieces obtained:

Post Biopsy screening(Immediate): yes/No

Post Biopsy : BP Immediate At 6 Hours.

Hb base line

18-24 hours :

24 hr USG Screening : Yes/No

If Yes : Findings

Any major complication

Gross Hematuria	
Blood transfusion	
Catheterisation and irrigation	
Intervention	

Biopsy report:

Glomerular compartment	
Interstitial compartment	
Tubular compartment	
Vascular compartment	
Immunofluroscence	
Electron Micrscopy	

Fibrosis Scoring

<25%	
25-50	
>50%	

Review biopsy report (in nephrology Department)-

Final diagnosis made

INFORMED CONSENT FORM

Study: Correlation of fibrosis in renal biopsy with ARFI estimated pre biopsy shear wave velocity

PATIENTS'S NAME:

I confirm that I have read the information sheet or information sheet was read to me and understood the information sheet dated ……. for the above study document and had its contents explained to me and understand the purpose of this study and what my participation in it will involve.

I do freely give my consent to participate in this study, as described to me in this document.

I am aware that I may, at any stage, withdraw participation from the study without prejudice, giving any reason without my medical care and legal rights being affected.

I understand the primary investigator; others working on the primary investigator's behalf, the Ethics committee and the regulatory authorities will not need my permission to look at my health records both in respect of the current study and any further research that may be conducted in relation to it, even if I withdraw from the trial. I agree to this access. I understand that my identity will not be revealed in any information released to third parties or published.

I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose.

I agree to take part in the above study.

_____	_____	_____
(Patient)	Signature/Thumb Impression	Date
_____	_____	_____
Impartial Witness	Signature	Date
(If patient is illiterate or gives oral and not signed consent)		
_____	_____	_____
Investigator	Signature	Date

सूचित सहमति

अध्ययन: ARFI बायोप्सी पूर्व कतरनी (shear wave)लहर वेग का अनुमान के
साथ गुर्दे की बायोप्सी में फाइब्रोसिस के सहसंबंध

रोगियों का नाम:

ऊपर अध्ययन सूचना पत्रक को पढ़ या सुन कर और उस में मेरी भागीदारी कि समझ कि पुष्टि ऊपर अध्ययन का उद्देश्य को और उस में शामिल होगी मेरी दस्तावेज़ और इसकी सामग्री मुझे समझाया गया था.

मैं स्वतंत्र रूप से इस दस्तावेज़ में मुझे बताए अनुसार, इस अध्ययन में भाग लेने के लिए अपनी सहमति देते हैं.

मुझे, किसी भी स्तर पर, मेरे चिकित्सा, देखभाल के ऊपर प्रतिकूल प्रभाव डाले बिना, बिना कोई कारण बताए और कानूनी अधिकार प्रभावित किया बिना अध्ययन से भागीदारी वापस ले सकने कि जानकारी है.

मैं समझ थ हूँ कि मैं परीक्षण से भागीदारी वापस लेने पर भी, प्राथमिक अन्वेषक, प्राथमिक अन्वेषक की ओर से काम कर रहे अन्य लोग, आचार समिति और नियामक अधिकारियों ,वर्तमान अध्ययन के संबंध में और किसी भी आगे के संबंध आयोजित अनुसंधान के क्षेत्र में अपने स्वास्थ्य रिकॉर्ड को देखने के लिए मेरी अनुमति की जरूरत नहीं होगी. मैं इस का उपयोग करने के लिए सहमत हैं. मैं समझ थ हूँ कि अपनी पहचान तीसरे पक्ष को जारी या प्रकाशित किसी भी जानकारी में नहीं व्यक्त कि जाएगा.

मैं इस तरह के एक प्रयोग को उपलब्ध कराई गई इस अध्ययन से उत्पन्न होने वाले किसी भी डेटा या परिणाम को केवल वैज्ञानिक उद्देश्य के लिए हीं इस्तेमाल करने के लिए किसी प्रतिबंध डाले बिना सहमति देते हैं.
मैं उपरोक्त अध्ययन में भाग लेने के लिए सहमत हैं.

_____
(रोगी) हस्ताक्षर/अंगूठा छाप तारीख

_____
निष्पक्ष गवाह हस्ताक्षर तारीख
(रोगी अनपढ़ है या तो मौखिक सहमति देता है और हस्ताक्षर नहीं किये)

_____
अन्वेषक हस्ताक्षर तारीख

సమ్మత పత్రము

అధ్యయనం: బయాప్సీ ముందు ultrasound ARFI కోత వేవ్ వేగం(shear wave velocity) అంచనా తో మూత్రపిండ బయాప్సీ లో ఫైబ్రోసిస్ యొక్క పరస్పర సంబంధం

పేరు:

పైన అధ్యయన సంబందిత సమాచారం పత్రము నేను చదివి లేదా విని మరియ అర్థం చేసుకున్నని నిర్ధారిస్తున్నను . అధ్యయనం యొక్క ఉపయోగం మరియు అందులో నా భాగస్వామ్యం ఎంత కలిగి ఉంటుంది నేను అర్థం చేసుకున్నను.

నేను స్వతంత్రంగా ఈ పత్రంలో నాకు వివరించినట్లు, ఈ అధ్యయనంలో పాల్గొనేందుకు నా సమ్మతము వ్యక్తపరస్తున్నను.

నేను, ఏదైనా కారణంగ, ఏ దశలోనైనా, నా వైద్య సంరక్షణ మరియు చట్టపరమైన హక్కులను ప్రభావితమ కాకుండ అధ్యయనం నుండి ఉపసంహరించుకోగలను.

ప్రాధమిక పరిశోధకుడి మరియు ప్రాధమిక పరిశోధకుడిని తరపున పనిచేస్తున్న వ్యక్తులు, ఎథిక్స్ కమిటీ మరియు నియంత్రణ అధికారులు చూడటానికి సంబంధించి మరియు సంబంధిత తదుపరి అధ్యయనంలో నా ఆరోగ్య రికార్డులను చూడటానికి నేను అధ్యయనం నుండి ఉపసంహరించుకన్న కూడా, నా అనుమతి అవసరం లేదని నేను అంగీకరిస్తున్నాను. నా గుర్తింపును మూడవ పక్షంనకు విడుదల లేదా ప్రచురించబడిన ఏ సమాచారంలో బహిర్గతం చెయ్యబడదు అని అర్థం చేనుకున్నను.

ఈ అధ్యయనం నుండి ఉత్పన్నమయ్యే సమాచారాన్ని లేదా ఫలితాల ఉపయోగం శాస్త్రీయ ప్రయోజనం కోసం మాత్రమే పరిమితమైనచో, అలాంటి ఉపయోగము నేను వ్యతిరేకించను.

_____

(రోగి) సంతకం/బొటనవేలి యొక్క ముద్ర తేదీ

_____

నిష్పాక్షిక సాక్షి సంతకం తేదీ
(రోగి నిరక్షరాస్యులుగా ఉంటే లేదా మౌఖిక అనుమతి)

_____

పరిశోధకుడిని సంతకం తేదీ

INFORMATION SHEET

Study: Correlation of ARFI estimated pre biopsy shear wave velocity measured in Native kidneys with fibrosis in renal biopsy

The Departments of Nephrology, Pathology and Radiology is conducting a study to find a correlation of pre biopsy ARFI shear wave velocity in native kidneys with a fibrosis in renal biopsy

Renal biopsy is done as part of evaluation of many renal diseases for diagnosis and assessing the progression, prognosticating of the disease and outcome of the therapeutic intervention. One of the reasons to do a renal biopsy is to know the extent of Tubulo-interstitial fibrosis which is the final common pathway for all renal disease. This estimate will help to prognosticate and modulate the therapeutic intervention.

We are doing this study to find out whether a pre biopsy non invasive test which is ARFI scan will be able to predict significant fibrosis in the kidneys by looking at the prebiopsy shear wave velocity and finding the correlation with renal biopsy specimen fibrosis scoring.

The subjects will be individuals in which the treating nephrologist has advised for a renal biopsy.If they give consent for the biopsy they will be enrolled in the study. We plan to document patients relevant history will include height, weight and follow up renal function tests as available with us from existing hospital records. Patient need to undergo a prebiopsy ARFI ultrasound scan which is non invasive and painless. No additional charges will be attributed in addition to the regular treatment requirement.

Think about it. Discuss it with your family and friends. If you have any doubts or questions you can ask any of us (Dr. Sudhakar). You can call nephrology office (228-2053) and mention about this study and they will direct you to one of us.

If you decide to participate please meet Dr. Sudhakar. He will give you the consent form. Read it and if you agree, sign it. He will take care of your participation after that.

In future, if you decide not to be involved in this study, inform us. We will remove your name from the study.

సమాచారం పత్రం

మూత్రపిండ,పాథాలజీ మరియు రేడియాలజీ విభాగాలు స్థానిక మూత్రపిండాల లో ARFI కోత వేవ్ వేగం తో మూత్రపిండ ముక్క(biopsy) పరీక్ష లో ఫైబ్రోసిస్ (Fibrosis) పరస్పర సంబంధం కనుగొనేందుకు ఒక అధ్యయనం నిర్వహిస్తున్నాము.

మూత్రపిండ ముక్క(biopsy) పరీక్ష అనేక మూత్రపిండ వ్యాధుల నిర్ధారణ కోసం పరిశోధనలో భాగంగా పూర్తి మరియు వ్యాధి తీవ్రత మరియు పురోగతి ఫలితం అంచనా వేయటానికి ఉపయోగపడ పడుతుంది. ముక్క(biopsy) పరీక్ష వలన ఒక ఉపయోగకరంగా విషయం ఏమిటంటే మూత్రపిండ లో ఫైబ్రోసిస్ (Fibrosis) ఏ మేరకు ఉందొ తెలుసుకోవటం . ఈ అంచనా చికిత్సకు సహాయం చేస్తుంది.
.
మూత్రపిండాల లో ARFI కోత వేవ్ వేగం తో మూత్రపిండ ముక్క(biopsy) పరీక్ష లో ఫైబ్రోసిస్ (Fibrosis) పరస్పర సంబంధం కనిపెట్టడం ద్వారా మూత్రపిండాలు గణనీయమైన ఫైబ్రోసిస్ అంచనా వెయ్యటాని ఇది ఒక హానికరం కాని పరీక్ష అని తెలుసుకోవడానికి ఈ అధ్యయనం చేస్తున్నారు.

మూత్ర పిండ జబ్బు ఉన్నవారికి వైద్యుడు ముక్క(biopsy) పరీక్ష సూచించిన తర్వాత వారు సమ్మతిస్తే అధ్యయనం చేర్చుకోవడానికి ఉంటుంది. మేము రోగుల సంబంధిత చరిత్ర నమోదు , బరువు ఎత్తు మరియు ఇప్పటికే ఉన్న ఆసుపత్రి రికార్డుల మరియు మాతో అందుబాటులో మూత్రపిండాల పనితీరు పరీక్షలు అనుసరిస్తాము . రోగికి హానికరం కాని ఇది ఒక ARFI అల్ట్రాసౌండ్ స్కాన్ చేయించుకోవలసి ఉంటుంది. సాధారణ చికిత్స అవసరాలకి అదనంగా అదనపు ఛార్జీలు ఆపాదించబడపు.

దీని గురించి ఆలోచించండి . మీ కుటుంబం మరియు స్నేహితులతో చర్చించిచండి. మీరు ఏ సందేహాలు లేదా ప్రశ్నలు ఉంటే మమ్మల్ని (డాక్టర్ సుధాకర్) అడగవచ్చు . మీరు మూత్రపిండ కార్యాలయం (228-2053) సంప్రదించవచ్చు.

మీరు పాల్గొనేందుకు నిర్ణయించుకుంటే డాక్టర్ సుధాకర్ కలిస్తే మీకు సమ్మత పత్రం ఇస్తారు. అది చదివి మీరు అంగీకరిస్తు ఉంటే, అది సంతకం చేయండి.

మీరు ఈ అధ్యయనంలో ప్రమేయం లేదని భవిష్యత్తులో నిర్ణయించుకుంటే, తెలియచేస్తున్నాయి. మేము అధ్యయనం నుండి మీ పేరు తొలగిస్తుంది .

सूचना शीट

अध्ययन: गुर्दे में ARFI कतरनी लहर वेग मापा अनुमान के साथ गुर्दे की बायोप्सी में फाइब्रोसिस के सहसंबंध

नेफ्रोलोजी , पैथोलॉजी और रेडियोलॉजी विभाग के एक बायोप्सी पूर्व ARFI कतरनी लहर वेग के साथ गुर्दे की बायोप्सी में फाइब्रोसिस का एक संबंध खोजने के लिए एक अध्ययन होर है

रोग की गंभीरता और प्रगति के परिणाम की जांच और मूल्यांकन के पूरा होने के हिस्से के रूप में विभिन्न गुर्दा रोगों के निदान के लिए परीक्षण करने के लिए गुर्दे टुकड़ा (बायोप्सी) परोसा जाएगा . परीक्षण का टुकड़ा (बायोप्सी) एक ज्ञात सीमा है जो गुर्दे फाइब्रोसिस (फाइब्रोसिस) में एक उपयोगी चीज है . यह आकलन के इलाज में मदद मिलेगी.

हम ARFI स्कैन कतरनी लहर वेग को देख और बायोप्सी नमूना में फाइब्रोसिस के साथ संबंध खोजने के द्वारा गुर्दे में महत्वपूर्ण फाइब्रोसिस की भविष्यवाणी करने में सक्षम हो जाएगा.

अध्ययन में नामांकन के बाद, हम प्रासंगिक इतिहास रोगियों ऊंचाई , वजन और गुर्दे परीक्षण मौजूदा अस्पताल के रिकॉर्ड से ही उपलब्ध हमारे साथ अनुवर्ती शामिल होंगे दस्तावेज़ की योजना है. रोगी और कोई जोखिम के साथ जुड़ा नहीं है. prebiopsy लिए अल्ट्रासाउंड स्कैन कराने की जरूरत है . नियमित उपचार अलावा कोई अतिरिक्त शुल्क आवश्यकता नहि होगा .

इसके बारे में सोचो . अपने परिवार और दोस्तों के साथ चर्चा करें. आप किसी भी संदेह या प्रश्न हैं, तो आप हमें (डॉ. सुधाकर) से पूछ सकते हैं. आप नेफ्रोलॉजी कार्यालय (228-2053) कॉल और इस अध्ययन के बारे में उल्लेख है और वे तुम हम में से एक के लिए निर्देशित करेंगे .

आप भाग लेने के लिए तय्र है तो डा. सुधाकर सहमति पत्र पर दे देंगे . इसे पढ़ें और अगर आप सहमत हैं , इस पर हस्ताक्षर . मैं उसके बाद अपनी भागीदारी का ख्याल रखना होगा .

आप इस अध्ययन में शामिल किया जाना तय नहीं है अगर भविष्य में , हमें सूचित करें. हम अध्ययन से अपना नाम हटा देगा .

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Assignment Inbox: The Tamil Nadu Dr. M.G.R. Medical University

	Info	Dates	Similarity	
Medical	ⓘ	Start 13-Nov-2013 12:50PM Due 31-Mar-2014 11:59PM Post 13-Nov-2013 3:00PM	15%	